Seagate

Viper 200

LTO Tape Drive

SCSI / Fibre Channel Interface Manual

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Introduction

The Seagate LTO drives are designed for computer environments requiring high performance, ultra-high capacity data storage. The drives are available in 5.25-inch internal configurations or as an external subsystem.

Seagate LTO drives contain an embedded Small Computer Systems Interface (SCSI) or Fibre Channel controller. Parallel SCSI drives provide synchronous or asynchronous SCSI and a high speed burst synchronous data transfer rate of 80 megabytes/second. Drives with Fibre Channel connections provide a burst transfer rate of 106.25 megabytes/second. The internal drives are tailored for easy installation in today's computers and the full-featured embedded controller facilitates easy integration into a variety of systems.

About This Manual

The information in this manual applies to the Viper 200 drive. For drive-specific installation and operational information, including connector information, refer to the Installation Guide or Product Description Manual for the specific model of your drive.

Interface Overview

The Seagate LTO drives are designed to operate with either the Small Computer System Interface (SCSI) bus or the Fibre Channel (FC) interface. This chapter discusses interface operation as it pertains to drive functions.

ANSI Interconnect Standards

In addition to the information presented in this manual, we recommend that you review the applicable SCSI-3 and Fibre Channel standards before writing host software drivers. Also, see the conformance statements, which are given in the Product Description Manual for each model of LTO drive.

SCSI is a set of standard interfaces established to support peripheral equipment such as printers, tape drives, magnetic disks, optical disks for microcomputers and other computer systems. The Parallel SCSI bus can support up to sixteen devices consisting of any multiple of host adapters and peripheral devices. The Fibre Channel interface can support up to 126 devices on an Arbitrated Loop and up to 16 million devices in a Fabric.

The Seagate LTO drives comply with SCSI-2 and SCSI-3 specifications. In a few cases, vendor unique features are available. These features are compatible with the SCSI standards.

LTO drives support LUN 0 in stand-alone mode and can support LUN 1 when installed in a media changer (tape autoloader or library).

Cabling and Connectors

The cabling requirements and pin assignments for the SCSI and Fibre Channel connectors for the internal drive models are given in the respective installation guide and Product Description Manual for each model of LTO drive.

General features

The Viper 200 supports the following:

- Operation in both single and multi-initiator systems
- Fixed and variable block transfer lengths
- Space blocks, filemarks, and EOD
- Log Sense and Log Select for managing soft error reporting

Parallel SCSI Interface

The interface is a sixteen-port daisy-chained bus using twenty-seven signal lines: eighteen data-bit signal lines and nine control lines. The eighteen data-bit lines are

made up of two pairs of eight data signal lines and one parity bit line. The remaining nine lines provide control and status signals to coordinate data transfer operations between the host controller and the selected drive.

The drives have an internal SCSI controller integrated into the drive electronics.

General features

The Viper 200 supports the following:

- Disconnect/reconnect, arbitration (required in SCSI-2 and SCSI-3)
- LVD and single-ended drivers
- Hard reset
- Synchronous data transfers
- Parity implemented (switch option)

Disconnect/Reconnect Function

When the drive is performing a task not requiring communication with the Initiator or when the tape drive determines that a relatively long time has passed with no bus activity, it disconnects from the SCSI bus. Examples are:

- When rewinding the tape.
- When writing to the tape and the buffer is full.
- When reading from the tape and the buffer is empty.
- When spacing, locating, or generally performing any tape motion when data cannot be transferred on the SCSI bus.

During the time the Target is disconnected for one of these functions, the bus is free for use by other devices. Both disconnect and reconnect are initiated by the Target.

If the tape drive is selected while disconnected, it only allows the following actions:

- If the command is from a different initiator or is from the same initiator but to a different LUN, the tape drive accepts the command and immediately disconnects if the command is a media-access command. If the new command is a Request Sense, Inquiry or Test Unit Ready, then the new command is executed immediately.
- Immediately following the selection, the Initiator may send the Identify, No Op, Abort, or Bus Device Reset messages to the drive.
- If the command is from the same initiator to the same LUN, the current command terminates with a Check Condition and an Abort Sense Key.

SCSI Messages

The SCSI message codes, descriptions, and directions are given in the following table. Each of these SCSI messages are supported by the Seagate LTO drive.

Code	Description	Direction
00h	Command Complete	In
01h	Extended Message*	In/Out
02h	Save Data Pointers	In

Code	Description	Direction
03h	Restore Pointers	In
04h	Disconnect	In
05h	Initiator Detected Error	Out
06h	Abort	Out
07h	Message Reject	In/Out
08h	No Operation	Out
09h	Message Parity Error	Out
0Ch	Bus Device Reset	Out
23h	Ignore Wide Residue	In
80h+	Identify	In/Out

Notes: In = Drive to host;   Out = Host to drive

* Only two extended messages are Supported: Synchronous Data Transfer Request and Wide Data Transfer Request.

Inbound messages

The following table lists drive to host SCSI messages and their definitions.

Message	Hex Code	Definition
Command Complete	00h	This message is sent by the drive at the end of the status phase to indicate that a command is complete. Once the message is sent, the drive releases the bus and goes to Bus Free
Disconnect	04h	This message is sent by the drive to indicate that it is about to disconnect from the bus and go to Bus Free. During a Data phase, it is always preceded by a Save Data Pointers message. If a Message Reject message is received in response to this message, then the disconnect is prevented.
Extended Message	01h	See page 11 for a description of extended message support
Identify	80h+	An Identify in message is sent to the initiator during reconnect to indicate which Logical Unit is reconnecting. The Disconnect Privilege and LUNTAR flags will both be clear
Ignore Wide Residue	23h	This message is sent by the drive to the initiator to indicate that a byte on a wide bus is not valid. This will be supported whenever a wide transfer is active.
Message Reject	07h	This message is sent to the initiator when the message received by the drive is unsupported or inappropriate.
Restore Pointers	03h	This message causes the initiator to reset its data transfer pointers to the values they held when the last Save Data Pointers message was sent. It will be sent when a parity error is detected on the bus or when an Initiator Detected Error message is received in order to retry the data phase.
Save Data Pointers	02h	This message instructs the initiator to save its current data transfer pointers for use with a subsequent Restore pointers message. This message will always be sent before a Disconnect message during data phases.

Outbound messages

The following table lists host to drive SCSI messages and their definitions.

Message	Hex Code	Definition
Abort	06h	An abort condition is generated. See Message exception handling on page 8.

Message	Hex Code	Definition
Bus Device Reset	0Ch	A reset condition is generated. . See Message exception handling on page 8.
Extended Message	01h	See Extended messages on the following page for a description of extended message support
Identify	80h+	The Identify Out message is sent by the initiator to identify the Logical Unit to be accessed and to set Disconnect Privilege. The LUNTAR flag must be zero. The Identify Out message must be sent as the first thing after selection. If it is sent at any other time, the drive will respond with a message reject message and go to Bus Free.
Initiator Detected Error	05h	The initiator has detected an error in the data being sent in a Message Command, Data or Status phase. The drive will retry the data burst or message. If the message is received immediately after an Identify message or after the Command Complete message has been sent, the drive will go Bus Free.
Message Parity Error	09h	The initiator has detected a parity error in a message. The drive will retry the message. If the message is received during a Command, Data or Status phase, immediately after an Identify message or after the Command Complete message has been sent, the drive will go Bus Free.
Message Reject	07h	This message is sent when the initiator does not support a message sent by the drive or considers the message inappropriate. If the message being rejected is Disconnect, Synchronous Data Transfer Request or Wide Data Transfer Request, the operation continues without those features. For all other messages except Restore Pointers, the message is treated as an Abort message. If the message is received during a Command, Data or Status phase, immediately after an Identify message or after the command complete message has been sent, the drive will go Bus Free.
No Operation	08h	This message has no effect and is ignored.

Extended messages

The following table lists extended SCSI messages and their definitions.

Hex Code	Message	Definition
Synchronous Data Transfer Request	01h	The drive will never initiate a Synchronous data transfer negotiation, but will expect the initiator to do so.
		If the message is received after selection and before command phase, it will then go to Message In phase and respond with a valid response to complete the negotiation.
		If the message is received at any other time, a Message Reject is sent in response.
Wide Data Transfer Request	03h	The drive will never initiate a Wide Data Transfer negotiation, but will expect the initiator to do so.
		If the message is received after selection and before Command phase, it will then go to Message In phase and respond with a valid response to complete the negotiation.
		If the message is received at any other time, a Message Reject is sent in response.

Parity errors

The following table describes the operation for each of the possible cases of parity error.

State or Phase	Description
Bus Free State	The drive does not detect nor react to parity errors on the SCSI bus while the drive is in a bus free state.
Arbitration Phase	The drive does not detect nor react to parity errors on the SCSI bus while arbitration is being performed.
Selection Phase	The drive does not detect nor react to parity errors on the SCSI bus while the drive is being selected.
Selection, Message Out Phase (Identify Message)	If the drive detects a parity error while the host is sending an Identify message, the drive retries forever.
Reselection, Message In Phase (Identify Message)	If the drive is attempting to reconnect to the host and the host asserts ATN because it detected an error, the drive: ♦ Switches the host to the Message Out Phase. ♦ Waits for the host to send a 09 (Parity Error Message) ♦ The drive then performs the retry option by: ♦ Switching the host to the Message In Phase. ♦ Resending the Identify Message
Command Phase	If the drive detects a parity error while the host is transferring a CDB, the drive: ♦ Switches the host to Message In phase ♦ Sends Restore Data Pointers (03h) message ♦ Switches the host to Command phase to retry the command. ♦ If a parity error occurs on the retry the host: ♦ Terminates the transfer. ♦ Switches the host to the Status Phase and sends a Check Condition. ♦ Switches the host to the Message In Phase and sends a Command Complete. ♦ Sets the Sense Key = B and ASC/ASCQ = 47-00 (SCSI-2 only).

State or Phase	Description
Data In Phase	If the host detects a parity error while data is being transferred from the drive and asserts ATN, the drive: ♦ Terminates the transfer of data. ♦ Switches the host to the Message Out Phase. ♦ Waits for the host to send a 05 (Host Detected Error). ♦ Switches the host to the Status Phase and sends a Check Condition. ♦ Switches the host to the Message In Phase and sends a Command Complete. ♦ Sets the Sense Key = B and ASC/ASCQ = 48-00 (SCSI-2 only).
Data Out Phase	If the drive detects a parity error while the host is transferring data, the drive: ♦ Terminates the transfer of data. ♦ Switches the host to the Status Phase and sends a Check Condition. ♦ Switches the host to the Message In Phase and sends Command Complete. ♦ Sets the Sense Key = B and ASC/ASCQ = 47-00 (SCSI-2 only).
Status Phase	If the host is in the Status phase and detects an error in the status byte and asserts ATN, the drive: ♦ Switches the host to the Message Out Phase and waits for the host to send 05 (Initiator Detected Error). ♦ Switches the host to the Status Phase and sends a Check Condition. ♦ Target sends restore pointers and resends Status.
Message In Phase	If the host is in the Message In Phase and detects an error on a message bytes an asserts ATN, the drive: ♦ Switches the host to the Message Out Phase. ♦ Waits for the host to send 09 (Parity Error Message). ♦ Switches the host to the Message In Phase and resends the message.
Message Out Phase	♦ If the host is in the Message Out Phase and sends a message bytes and the drive detects a parity error, the drive retries forever.

An Initiator that accommodates disconnect/reconnect can indicate this capability to the tape drive during the Selection phase by asserting both its own Initiator SCSI ID bit as well as the tape drive's SCSI ID bit (allows the tape drive to know with which Initiator to reconnect). The Initiator must also assert ATN before exiting the Selection phase (prior to releasing SEL) and send an Identify message out of C0h to the tape drive. This sequence causes the drive to enter the Message-Out phase when the Selection phase completes.

The first message sent by the host after the Selection phase is an Identify message. Under normal conditions, the first message sent by the tape drive after a Reselection phase is also Identify. Under certain exceptional conditions, the host may send the Abort message or the Bus Device Reset message instead of Identify as the first message.

Message exception handling

Message exceptions are handled as described in the following tables. The numbers in the tables identify the actions that the drive takes when an exception under the identified conditions occurs. The action are described following the tables.

Phase During Which ATN is Raised

Message	Selection	Ident.	Cmd	Data in	Data out	Status	sdtr/wdtr
Abort (06h)	2	2	2	2	2	2	2
BDR (0Ch)	2	2	2	2	2	2	2
Identify (80h/C0h)	12	7, 11	7, 11	7, 11	7, 11	7, 11	7, 11
IDE (05h)	5	2	If Retry, 8, else 5	If Retry, 8, else 5	If Retry, 8, else 5	If Retry, 8, if Status, 2, if No Status, 5	If Retry, 4, else 5
Reject (07h)	5	2	2	2	2	2	1
Parity (09h)	5	2	11	11	11	11	If Retry, 4, else 5
NOP (08h)	5	9	9	9	9	9	If EOM, 9, else 4
SDTR	5	10	7, 11	7, 11	7, 11	7, 11	10
WDTR	5	10	7, 11	7, 11	7, 11	7, 11	10
Unrecognized or illegal	5	6	6	6	6	6	If EOM, 6, else 4

Message-In Byte During Which ATN is Raised

Message	SDP (02h)	Restore Pointers (03h)	Disconnect (04h)	Reject (07h)	Identify (80h)	CC (00h)	Ignore Wide Residue (23h)
Abort (06h)	2	2	2	2	2	2	2
BDR (0Ch)	2	2	2	2	2	2	2
Identify (80h/C0h)	7, 11	7, 11	7, 11	7, 11	7, 11	2	7, 11
IDE (05h)	If Retry, 4 else 5	If Status, 2, if No Status, 5	If Retry, 4, else 5	If Retry, 4, else 13	If retry, 4, else 5	2	If retry, 4, else 5
Reject (07h)	2	If Status, 2, if No Status, 5	1	2	2	2	2
Parity (09h)	If Retry, 4 else 5	If Status, 2, if No Status, 5	If Retry, 4, else 5	If Retry, 4, else 13	If Retry, 4, else 5	2	If Retry, 4, else 5
NOP (08h)	9	9	9	9	9	2	If EOM, 9, else 4
SDTR	7, 11	7, 11	7, 11	7,11	7, 11	2	7, 11
WDTR	7, 11	7, 11	7, 11	7,11	7, 11	2	7, 11
Unrecognized or illegal	6	6	6	6	6	2	If EOM, 6, else 4

Retry	Retry has not been exhausted	Status	Status has been reported
EOM	End of the message	No Status	Status has not been reported

Action codes used in previous tables

1. The Message Out Reject disables the feature and continues. In case of Message In Disconnect, the drive disables further "Disconnects" on the current command. In case of Message In SDTR, both the initiator and the drive go to asynchronous mode. In case of Message In WDTR, the drive goes to 8-bit data transfer mode.

2. The drive goes Bus Free by releasing BSY without sense data set up.

3. The Message Out Abort or Bus Device Reset will result in the drive going Bus Free and therefore abnormally terminating the command.

4. The drive re-sends the message.

5. The drive posts Check Condition status indicating an Aborted command.

6. The drive rejects the message by Message In Reject and continues its operation.

7. The drive rejects the message by Message In Reject.

8. The drive sends Message In Restore Pointers and retries if retry is not exhausted.

9. The drive ignores the message and continues.

10. The wide data transfer agreement is negotiated prior to negotiating the synchronous data transfer agreement.

11. The drive goes Bus Free by releasing BSY with sense data set up.

12. The drive continues the normal process.

13. If the drive is continuing an operation after sending a Message in Reject, the drive will post Check Condition status indicating an Aborted command (Action 5), if not, The drive will go Bus Free by releasing BSY without sense data set up (Action 2).

Fibre Channel Interface Overview

The interface is a bi-directional serial connection. By connecting devices to a hub, a loop of up to 126 devices can be constructed. Up to 16 million devices can be connected via a switch.

The Viper 200 FC drives have an internal FC controller integrated into the drive electronics.

General features

Viper 200 FC supports the following:

- Connection in point-to-point, arbitrated loop, and fabric topologies as an NL_Port
- Command queuing

- Both single and multi-initiator systems

- Dual ports

- Reset via Target Reset and Logical Unit Reset task management requests as well as by selective and broadcast Reset LIP

- Auto Contingent Allegience. For details, see the SCSI Architectural Model–2 (SAM-2) standard.

Link Services

The following basic link services, extended link services, and FC-4 link services are supported by Viper 200 FC:

- Abort Sequence (ABTS)

- Accept (ACC)

- Basic Accept (BA_ACC)

- Basic Reject (BA_RJT)

- Discover Address (ADISC)

- Discover N_Port Parameters (PDISC) – Obsolete, but supported for legacy compatibility

- Fabric Login (FLOGI)

- Fabric Address Notification (FAN)

- Logout (LOGO)

- Link Service Reject (LS_RJT)

- N_Port Login (PLOGI)

- Process Login (PRLI)

- Process Logout (PRLO)

- Read Exchange Concise (REC)

- Read Link Error Status Block (RLS)

- Registered State Change Notification (RSCN)

- Report Node Capabilities Information (RNC)

- Report Node FC-4 Types (RNFT)

- Report Port Speed Capabilities (RPSC)

- Request Node Identification Data (RNID)

- Read Port List (RPL)

- Read Port Status Block (RPS)

- Reinstate Recovery Qualifier (RRQ)

- Request Sequence Initiative (RSI)

- Read Sequence Status Block (RSS)

- Sequence Retransmission Request (SRR)

- State Change Registration (SCR)

- Third Party Process Logout (TPRLO)

Name Server Requests

When attached to a fabric, the drive will issue the following name server requests:

- Register FC–4 TYPEs (RFT_ID)
- Register FC–4 Features (RFF_ID)

Task Management Requests

The Fibre Channel drives support the following SCSI-3 Task Management Requests:

- Abort Task
- Abort Task Set
- Clear ACA
- Clear Task Set
- Logical Unit Reset
- Target Reset

Standards Conformance

The Small Computer System Interface and Fibre Channel interface are described in standards including several versions and a number of individual documents. The original Small Computer System Interface Standard, X3.131-1986, is referred to herein as SCSI-1. SCSI-1 was revised resulting in the Small Computer System Interface – 2 (X3.131-1994), referred to herein as SCSI-2. The set of SCSI-3 standards are collectively referred to as SCSI-3. The applicable standards are as follows:

SCSI-3 Architecture Model (SAM) ANSI/NCITS X3.270: 1996

SCSI Architecture Model – 2 (SAM-2) in development

SCSI-3 Primary Commands (SPC) Status: ANSI/NCITS X3.301: 1997

SCSI Primary Commands – 2 (SPC-2) ANSI/INCITS 351-2001: 2001

SCSI Primary Commands – 3 (SPC-3) in development

SCSI-3 Medium Changer Commands (SMC) ANSI/NCITS.314: 1998

SCSI-3 Medium Changer Commands – 2 (SMC-2) in development

SCSI-3 Stream Commands (SSC) ANSI/NCITS 335: 2000

SCSI-3 Stream Commands – 2 (SSC-2) in development

Fibre Channel Protocol (FCP) ANSI/NCITS X3.269-1996: 1996

Fibre Channel Protocol – 2 (FCP-2) in development

Fibre Channel Arbitrated Loop – 2 Amendment (FC-AL-2) NCITS 332-1999: 1999

Fibre Channel – Fabric Loop Attach - Direct Attach (FC-FLA) NCITS TR-20-1998

Fibre Channel – Tape and Tape Medium Changers (FC-TAPE) ANSI/NCITS TR-24-1999

Fibre Channel – Private Loop SCSI Direct Attach (FC-PLDA) ANSI/NCITS TR19-1997

Fibre Channel – Methodologies for Interconnects (FC-MI) in development

Fibre Channel Physical Interface (FC-PI) in development

Fibre Channel Framing and Signalling (FC-FS) in development

Note: The term SCSI is used wherever it is not necessary to distinguish between the versions of SCSI.

LTO Conformance

Seagate LTO drives conform to the requirements of the *Generation 1 SCSI Common Command Set Advisory Document* (AU1-SCSI) for Ultrium format devices.

General Behaviors

Reset Condition

When a reset is issued to the tape drive, the drive clears all uncompleted commands, releases all SCSI device reservations, sets the tape drive to default modes. The Parallel SCSI drive returns to the Bus Free phase.

Unit Attention Condition

The Unit Attention condition in the tape drive typically results from the following conditions:

- A Reset was previously issued to the drive.
- The drive has just been powered on.
- A cartridge has been inserted.
- A log exception condition occurred.
- The mode pages have been changed.
- The cartridge has been loaded or unloaded to the Hold position, and the Medium Auxiliary Memory (MAM) is accessible.

The Unit Attention Condition persists for each Initiator until that Initiator issues a command other than Inquiry for which the tape drive returns with a Check Condition Status. If the next command from that Initiator following the Check Condition Status is Request Sense, then the unit attention sense key is returned. Because Fibre Channel drives support autosense, the sense data is returned in the FCP_RSP information unit in which the Check Condition Status is reported, and a Request Sense command is not necessary.

If the Inquiry Command is received from an Initiator with a pending Unit Attention Condition before the tape drive reports Check Condition Status, the tape drive performs the Inquiry Command and does not clear the Unit Attention Condition.

If the Request Sense Command is received from an Initiator with a pending Unit Attention Condition before the tape drive reports Check Condition Status, the tape

drive reports unit attention sense key and clears the Unit Attention Condition for that Initiator.

Contingent Allegiance Condition

The Contingent Allegiance condition shall exist following the return of Check Condition and may exist following an unexpected disconnect. The contingent allegiance condition shall be preserved for the I T x nexus until it is cleared. The contingent allegiance condition shall be cleared upon the generation of a hard reset condition or by an Abort message, a Bus Device Reset message, or any subsequent command for the I T x nexus. While the contingent allegiance condition exists the drive shall preserve the sense data for the initiator.

While the contingent allegiance condition exists, the drive shall respond to any other requests for access to the logical unit from another initiator with a Busy status. Execution of queued commands shall be suspended until the Contingent Allegiance condition is cleared.

Buffered Mode

Buffered Mode allows the most efficient operation of a tape drive. The drive defaults to Buffered mode. In this mode, the drive signals Command Complete when all requested data for a Write command has been transferred from the host to the tape drive buffer. This mode provides data to maintain operation while the host readies a new Write Command.

If an error occurs in writing data to the tape after the tape drive signals Command Complete, an error status is sent on the next Command issued.

Immediate Function

For Initiators that do not support the disconnect feature, the Immediate bit provides a means of releasing the bus while the drive is busy completing a function such as repositioning the tape. If a command is sent by the Initiator after a previous Immediate Command was accepted, the drive continues the Immediate Function it is currently performing and may disconnect, execute, or reject the new command depending on the new command.

An immediate bit of zero means that the status is returned to the Initiator when the operation is completed. (For example, the status is returned when the tape has been repositioned.) An Immediate bit of one means that the status is returned to the Initiator as soon as the function is started.

Residual Length Function

When performing a Write command, the drive returns a Good Status and Command Completion Message when the last byte requested by the command is placed in the Data Buffer, rather than when it is written onto tape. If an error occurs while data is being written onto tape, the drive calculates the Residual Length and places this value in the information bytes of the Sense Data Block. Also, the Residual Length functions for other commands, such as Read.

Residual Length is calculated by: $RL = TL - AL$

Where:

AL (Actual Length) =   Blocks transferred from the host to the tape drive across
                               the SCSI bus.

TL (Transfer Length) =   The Transfer Length from bytes 2-4 of the Write com-
                               mand (Request Transfer Length).

RL (Residual Length) =   The amount of blocks or bytes not written to tape.

Early Warning Function

Early Warning on the Viper drive is a logical warning given when 64 megabytes of
storage space remain on the tape. The position is calculated by the drive. When this
physical position is reached on a tape, the following occurs.

1.   The command completes with a Check Condition and a 40h Sense data mean-
     ing EOM and no Sense Key.

2.   Subsequent WRITE commands write data and complete with check condition
     with EOM Status and No Sense Key until the physical tape end is encountered.

Error Reporting

Soft errors are generally tape-quality related and occur more frequently during write
operations than during read operations. Soft errors indicate repeated attempts by the
drive to read or write data on the tape. Some soft errors are normal, but an increase
in the usual count can indicate deteriorating tape quality. If the soft error count
remains higher than normal, use a cleaning cartridge to clean the read/write heads. If
this procedure does not clear the problem, change to a new tape cartridge.

If a hard error (unrecoverable error) occurs during operation, the drive terminates
operation immediately and returns a Check Condition. The Initiator should cease any
further read or write functions and issue a Request Sense Command to determine
the type of error.

When the drive detects a write error, it attempts to rewrite the data up to 128 times.

After the 128th attempt, the error is considered unrecoverable and the operation
terminates. When a hard error is encountered, replace the tape with a new cartridge
and repeat the function or clean the heads with a cleaning cartridge.

Variable and Fixed Mode Recording

The Viper drive can write either fixed or variable block sizes. The recording mode is
determined by the Fixed bit in the SCSI Write and Read commands.

If the Fixed bit is set, the Mode Select command sets the size of the next block or
multiple blocks to be written with the next Write command. When a Write command
is issued with the Fixed bit set, the current block size is implemented. The transfer
length specifies the number of blocks to be written with this size. If a Write command
is issued with the Fixed bit set and the current block size set to 0, the Viper drive
returns a Check Condition with Illegal Request Sense Key. When writing with the

Fixed bit set, each Write command specifies the number of contiguous blocks to be written of a fixed size, resulting in fixed-mode blocks. If the Fixed bit is reset, then only one block can be written on the tape per SCSI Write command CDB. In that case, the Write command CDB transfer length specifies the size of the block to be written in bytes. With the Fixed bit reset, the current block size specified with the last Mode Select command is ignored.

Setting the block size to 0 in the Mode Select page descriptor is not required. Therefore, with the Fixed bit reset, each SCSI Write command may specify a different byte count, resulting in variable-mode blocks.

The host may switch between fixed and variable mode recording. By issuing the Mode Select command to specify different block sizes, blocks can be written to the tape with different block sizes in the fixed mode. Also, the host may change the block size after BOM, allowing on-the-fly block-size changes.

The Read command Fixed bit also specifies fixed or variable mode. When reading in variable mode, the host must know the size of the block to be read from the tape in advance in order to avoid causing the Viper drive to return a Check Condition with Incorrect Length indicated in the Sense data (ILI). Also, the data transfer may be truncated (cut off) when the recorded block does not match the transfer length in variable mode or the current block size in fixed mode.

The Read command includes a SILI bit to Suppress ILI Check conditions.

When the SILI bit is set, the host usually specifies the maximum block size before reading so that the data blocks are not truncated, and no Check Conditions are generated.

The SCSI Read Block Limits command returns the minimum and maximum block sizes that the Viper drive can support. The Block Limits data is not modified to reflect the current mode of writing—fixed or variable. The Block Limits returned data is not modified to reflect the current block size for the next fixed-mode Write. The Mode Sense command is used for that purpose.

Library Features

Auto Unload Mode

The Viper drive has an Auto Unload Mode that may be accessed via a Mode command to Mode Page 21h. The purpose of the Auto Unload mode is to allow the drive to be configured to work in Library systems or as a Stand Alone drive. The Auto Unload mode allows the drive to control how the tape is unloaded in "automatic" type situations. There are four Auto Unload modes that are possible.

- Do Nothing – Stay threaded at BOT.

- Unthread Only

- Unthread and unload

- Unthread and unload non data cartridges, data cartridges go to BOT.

Here are the possible "automatic" situations where the ejection process will be controlled using the Auto Unload mode. As shown in the list below, this covers not

only power on situations, but also how cleaning tapes, incompatible tapes and firmware tapes are handled.

- Powering on or power cycling while the tape is inside the drive.

- Cleaning tape has finished the cleaning cycle.

- Unsupported data tape has been loaded.

- Unsupported cleaning tape has been loaded.

- Microcode download from a firmware tape.

- Microcode download via the SCSI Write Buffer command while a tape is loaded.

Host Unload Override

The Viper drive has a Host Unload Override mode that may be accessed via a Mode command to Mode Page 21h. The purpose of the Host Unload Override mode is to allow the Library system to set the drive into a mode where the drive will not eject the cartridge should the host issue a SCSI Unload command. A SCSI Unload command from the host will cause the tape to be unthreaded but the cartridge will remain in the drive. The Library Unload command will cause the cartridge to be ejected.

ID Modification

Tape libraries require the ability to change the SCSI ID of installed tape drives without opening the library and changing address jumpers. To change the SCSI ID (Parallel SCSI Interface) or Assigned Loop Identifier (Fibre Channel Interface) of the Viper drive, issue a Mode Select command to Mode Page 22h to change the Next Selection ID field to the desired ID. Then reset or power cycle the drive, and it will begin responding to the new ID. This new ID will persist through additional resets and power cycles.

If the address jumpers are changed and the drive's power is cycled, the drive will respond to the new address on the jumpers. The value in the Next Selection ID field will be that on the jumpers, even though the field may have been changed immediately before the power cycle.

For the mapping between the Fibre Channel Assigned Loop Identifier and the Arbitrated Loop Physical Address (AL-PA), see the FCP-2 standard.

LUN 1 Command Forwarding

A tape library or autoloader containing a Viper can receive its SCSI commands via the Viper. This function is called "Command Forwarding" and is enabled via the "CmdFwd" field in the Interface Control mode page (22h). When enabled, commands received via the SCSI bus and addressed to LUN 1 are immediately transmitted to the library via the RS-422 interface. Viper acts as a bridge, passing commands, data, and status between the initiator and the library, as specified in the Library Interface Encapsulated SCSI Protocol Manual.

In SCSI Medium Changer terminology, the library or autoloader appears as an "independent medium changer," because the tape drive and medium changer are at different LUNs. Medium changer commands addressed to LUN 0 are rejected with

Check Condition and sense data of Illegal Request / Invalid Command Operation Code (05/20/00).

Because of the relatively slow communication on the RS-422 interface, Viper will disconnect from the SCSI bus after receiving a command, after receiving data-out, and after sending status. Data-in and status are sent to the initiator without disconnecting between them.

If the link fails between the Viper and the library, a command will receive a status of Check Condition and sense data of Aborted Command / Logical Unit Communication Failure (0B/08/00).

If a SCSI bus reset is received, a target reset task management request is transmitted to the library.

When command forwarding is disabled in mode page 22h, commands addressed to LUN 1 will receive a status of Check Condition and sense data of Illegal Request / Logical Unit Not Supported (05/25/00).

After Command Forwarding is enabled or disabled, the drive will respond to the next command with a Check Condition and sense data of Unit Attention / Reported LUNs Data Has Changed (06/3F/0E).

SCSI Commands

This chapter describes the SCSI commands for the LTO tape drive.

Command Set

The following table shows the SCSI commands for sequential access devices implemented by the drive.

Group	Code	Command	Page
0	00h	Test Unit Ready	126
0	01h	Rewind	120
0	03h	Request Sense	108
0	05h	Read Block Limits	90
0	06h	Park Unpark	75
0	08h	Read	84
0	0Ah	Write	130
0	10h	Write Filemarks	135
0	11h	Space	124
0	12h	Inquiry	24
0	13h	Verify	128
0	15h	Mode Select(6)	44
2	55h	Mode Select(10)	44
0	16h	Reserve Unit	118
0	17h	Release Unit	101
0	19h	Erase	22
0	1Ah	Mode Sense(6)	69
2	5Ah	Mode Sense(10)	69
0	1Bh	Load Unload	35
0	1Ch	Receive Diagnostic Results	99
0	1Dh	Send Diagnostic	121
0	1Eh	Prevent/Allow Medium Removal	75
0	0Bh	Set Capacity	122
1	2Bh	Locate	38
1	34h	Read Position	95
1	3Bh	Write Buffer	132
1	3Ch	Read Buffer	92
2	44h	Report Density Support	103
2	4Ch	Log Select	40
2	4Dh	Log Sense	44
2	56h	Reserve Unit	118
2	57h	Release Unit	101
2	5Eh	Persistent Reserve In	76
2	5Fh	Persistent Reserve Out	79
3	A0h	Report LUNS	106

Conventions

The commands in this chapter are listed in alphabetical order. Each command is described, its Command Descriptor Block (CDB) illustrated, and the Completion Status is given. Bits and fields defined in the ANSI SCSI documents that are not used by the drive are not described in this document. Bits and fields that are supported by the drive are described.

Command Descriptor Blocks

A host makes request of the tape drive by sending a Command Descriptor Block (CDB). Some commands also require a parameter list. If the CDB or the parameter list contains an invalid parameter, the drive terminates the command, returning a Sense Key of Illegal Request, without altering the medium.

Command Descriptor Block Formats

SCSI six-byte Command Descriptor Blocks are arranged in the format shown in the following table.

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code							
1	Ignored LUN			Command Dependent				
2	Command Dependent							
3	Command Dependent							
4	Command Dependent							
5	Control							

SCSI ten-byte Command Descriptor Blocks are arranged in the format shown in the following table.

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code							
1	Ignored LUN			Command Dependent				
2	Command Dependent							
3	Command Dependent							
4	Command Dependent							
5	Command Dependent							
6	Command Dependent							
7	Command Dependent							
8	Command Dependent							
9	Control							

Field names that are centered represent fields that are at least one byte long. Field names that are left-aligned with a bit number are one or more bits long. The length is indicated by the beginning of the following field name, and by the Bits column in the Field Descriptions table on the following page.

Field Descriptions

Field	Byte	Bits	Description
Operation Code	0		The Operation Code is made up of the Group Code and the Command Code. See Operation Code Format, below.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Command Dependent	1 2-4 2-8	0-4	See the specific command.
Reserved			All reserved bits must be 0.
Control	Last		The Control byte is made up of the Vendor Unique, Flag and Link bits. See Control Format, below.

Fields that are one byte or longer have no entry in the Bits column.

Operation Code Format

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Group Code		Command Code					

Field Descriptions

Field	Byte	Bits	Description
Group Code	0	5-7	The SCSI command group.
Command Code *	0	0-4	The SCSI command code.

NOTE: The Group Code and Command Code together make the Operation Code.

Control Byte Format

Byte	Bits							
	7	6	5	4	3	2	1	0
Last	Vendor Unique		Reserved			NACA	Flag	Link

Field Descriptions

Field	Byte	Bits	Description
Vendor Unique	Last	6-7	Not used, always 0.
Reserved	Last	3-5	All reserved bits must be 0.
NACA	Last	2	Parallel SCSI Interface: Not supported; reserved. Fibre Channel Interface: Supported.
Flag and Link bits	Last	0-1	These bits are not supported by the Viper drive.

Command Status

When the tape drive competes a command it responds with a status byte. The format of the status byte is shown below.

Status Byte Format

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Reserved		Status Code					

Field Descriptions

Field	Byte	Bits	Description
Reserved	0	6-7	Always 0
Status Code	0	0-5	The command status, as shown below.

Status Codes

Status codes for the Viper drives are shown in the following table.

Description	Value	When returned
Good Status	00h	The command completed without problems
Check Condition	02h	A problem occurred during command execution. The sense data should be examined to determine the nature of the problem.
Busy	08h	The drive is unable to accept the command at this time. This is only returned during the power on sequence or if there are commands from too many initiators outstanding.
Reservation Conflict	18h	This is returned if the drive is reserved for an initiator other than the one sending the command

ERASE

The Erase command marks the tape, from the current position to the end of tape, as erased.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (19h)							
1	Ignored LUN			Reserved			Immed	Long
2	Reserved							
3	Reserved							
4	Reserved							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Erase is 19h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Immed	1	1	0 = Status is not returned until the tape is erased.
			1 = Status is returned as soon as the operation is initiated.
Long	1	0	0 = Short Erase is performed and EOD is recorded at the current tape position.
			1 = Long data-security Erase is performed, and EOD is recorded from the current tape position to the end of the tape.
Reserved			All reserved bits must be 0.
Control			See Control Byte Format on page 20.

If the Immediate (Immed) flag is set to 1, then the drive validates the command and waits for any previous command from any host to complete including any immediate commands currently being processed and for any buffered data to be flushed to tape. It will then report a deferred error for any preceding command or buffered data if appropriate. If there is no deferred error, the drive reports good status and initiates the command. If the Immediate (Immed) flag is set to 0, status is not returned until after the command has completed.

If the Long bit is set, EOD is written at the current position. Data Set Separators are then written from EOD to the end of the medium to overwrite any data currently on the tape. If the Long bit is clear, then an EOD is written at the current position marking it as end of data.

Completion Status

Code	Message	Description
00h	Good Status	• The drive remains in any previously set modes.
		• The drive is ready to perform any appropriate command.
		Note: If Immed is 1, then Good Status only indicates that the command is valid.

Code	Message	Description
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:

Code	Message	Description
02h	Not Ready	No cartridge is in the drive.
03h	Media Error	Unrecoverable data error encountered.
04h	Hardware Error	Parity error on the SCSI bus or drive hardware failure detected.
05h	Illegal Request	Both the Immed bit and the Link bits are 1, or the Command Descriptor Block is invalid.
06h	Unit Attention	The cartridge was changed or the drive was reset prior to this command.
07h	Write Protect	The cartridge is write protected.

INQUIRY

The Inquiry command requests that the drive return information about itself. If an Inquiry command is received from an Initiator with a pending Unit Attention Condition (before the drive reports Check Condition status), the drive performs the Inquiry command and does not clear the Unit Attention Condition.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (12h)							
1	Ignored			Reserved				EVPD
2	Page Code							
3	Reserved							
4	Allocation Length							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Inquiry is 12h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
EVPD	1	0	0 = Requests Standard Inquiry Data. 1 = Requests data page specified by the Page Code.
Page Code	2		00h = Requests Supported Vital Product Data Page 80h = Requests Unit Serial Number Page 83h = Requests Device Identification Page C0h = Requests SCSI Firmware Revision Page C1h = Requests Servo Firmware Revision Page C2h = Requests Head Assembly Serial Number Page C3h = Requests Reel Motor 1 Serial Number Page C4h = Requests Reel Motor 2 Serial Number Page C5h = Requests Board Serial Number Page C6h = Requests Base Mechanical Serial Number Page DFh = Requests Drive Status Page
Allocation Length	4		Specifies the amount of data to be returned, in bytes. A value of 0 is a valid entry and returns no data. The drive transfers the number of bytes specified up to a maximum of 38h for Standard Inquiry.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

If the Enable Vital Product Data (EVPD) flag is clear and the Page Code is zero, Standard Inquiry Data is returned. If the Enable Vital Product Data (EVPD) flag is set and the Page Code is zero, the Supported Vital Product Data Pages page is returned.

If the Enable Vital Product Data (EVPD) flag is set and the Page Code is not zero and there is a vendor defined Inquiry data page corresponding to that page code, then that page is returned. Otherwise, Check Condition status is returned. The

Sense Key is set to Invalid Request (5) and the additional Sense to Invalid Field in CDB (2400).

Standard Inquiry Data Page

Byte	Bits 7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	RMB	Reserved						
2	Version							
3	AENC	Obso-lete	NACA	HiSup	Response Data Format			
4	Additional Length							
5	Reserved							
6	BQue	EncSrv	VS	MuiltiP	MChgr	Obso-lete	Obso-lete	Adr16
7	RelAdr	Obso-lete	WBus16	Sync	Linked	Trans-Dis	CMdQ	VS
8 – 15	Vendor Identification							
16 – 31	Product Identification							
32 – 35	Product Revision Level							
36 – 55	Vendor Specific							

Field Descriptions

Field	Bytes	Bits	Description
Peripheral Qualifier	0	5-7	Always 000b.
Peripheral Device Type	0	0-4	Normally 01h to indicate a sequential access device. 7Fh indicates that a logical unit is not present. This value is returned when an invalid LUN was in the last Identify message.
RMB	1	7	Always 1, indicating Removable Media.
Version	2		Always 3
AENC	3	7	Always 0, indicating Asynchronous Event Notification Capability is not supported.
NACA	3	5	0 = Normal ACA (NACA) is not supported (Parallel SCSI drives) 1 = Normal ACA (NACA) is supported (Fibre Channel drives)
HiSup	3	4	Always 0, indicating Hierarchical Support is not supported.
Response Data Format	3	0-3	Always 2, indicating support of the SCSI-2 standard.
Additional Length	4		Always 33h, indicating that 51 bytes of additional Inquiry command parameters follow, beginning in Byte 5. This value does not change if the Allocation Length in the CDB is too small or too large to accommodate the entire response.
BQue	6	7	0 = Basic Queuing not supported (Parallel SCSI drives) 1 = Basic Queuing supported (Fibre Channel drives)
EncSrv	6	6	Always 0, indicating Enclosure Services is not supported.
VS	6	5	Always 0, indicating this feature is not supported.
MuiltiP	6	4	0 = Multiple Interface Ports not available (SCSI drives) 1 = Multiple Interface Ports are available (Fibre Channel drives).
MChgr	6	3	Always 0, indicating Medium Changer is not supported.

Field	Bytes	Bits	Description
Adr16	6	0	0 = 16 Bit Address not available (Fibre Channel drives)
			1 = 16 Bit Address supported (Parallel SCSI drives)
RelAdr	7	7	Always 0 because Relative Addressing is not supported.
WBus16	7	5	0 = Wide Bus16 not available (Fibre Channel drives)
			1 = Wide Bus16 supported (Parallel SCSI drives)
Sync	7	4	0 = Synchronous Transfer not supported (Fibre Channel drives)
			1 = Synchronous Transfer is supported (Parallel SCSI drives)
Linked	7	3	Always 0, indicating Linked Command is not supported.
CmdQ	7	1	0 = Command Queuing is not supported (Parallel SCSI drives)
			1 = Command Queuing supported (Fibre Channel drives)
VS	7	0	Always 0, indicating this feature is not supported.
Vendor Identifica- tion	8-15		8 bytes of ASCII data: "SEAGATE" followed by 1 space.
Product Identifica- tion	16-31		16 bytes of ASCII data: "ULTRIUM06242-XXX".
Product Revision Level	32-35		4 bytes of ASCII data indicating the SCSI firmware version.
Vendor Specific	36-55		This field may contain additional vendor specific information.
Obsolete			Always 0
Reserved			Always 0

The Standard Inquiry Data is based on the SCSI 3 standard for Standard Inquiry Data. This allows for setting certain bits in byte 6 to indicate features that were non-standard in SCSI 2. The only supported SCSI 3 field is Multi Port (MultiP).

The Multi-Port (MultiP) flag is set if the device has multiple interface ports. Parallel SCSI devices will not have multiple interface ports and will have this flag clear. Fibre Channel devices will have multiple interface ports and will have this flag set.

The 16 Bit Address (Adr16) and Wide Bus 16 (WBs16) flags are set depending on whether the hardware supports these bus features. These flags are only valid for parallel SCSI and are clear for all other low level interfaces.

Supported Vital Product Data (VPD) Page (00h)

The Supported Vital Product Data Page lists the following eleven VPD pages including itself.

Supported Vital Product Data Inquiry Page

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	Page Code							
2	Reserved							
3	Page Length							
4	Supported Vital Product Data Page Code							
5	Unit Serial Number Page Code							
6	Device Identification Page Code							

Byte	Bits 7	6	5	4	3	2	1	0
7	SCSI Firmware Revision Page Code							
8	Servo Firmware Revision Page Code							
9	Head Assembly Serial Number Page Code							
10	Reel Motor 1 Serial Number Page Code							
11	Reel Motor 2 Serial Number Page Code							
12	Board Serial Number Page Code							
13	Base Mechanical Serial Number Page Code							
14	Drive Status Page Code							

Field Descriptions

Field	Bytes	Bits	Description
Peripheral Qualifier	0	5-7	Always 000b.
Peripheral Device Type	0	0-4	Normally 01h to indicate a sequential access device. 7Fh indicates that a logical unit is not present. This value is returned when an invalid LUN was in the last Identify message, or the LUN field of the Identify CDB.
Page Code	1		Always 0, indicating the Supported Vital Product Data Inquiry Page
Reserved	2		Always 0
Page Length	3		Always 0Bh to indicate 11 listed pages.
Supported Vital Product Data Page Code	4		Always 00h, the page code of the Supported Vital Product Data Inquiry Page
Unit Serial Number Page Code	5		Always 80h, the page code of the Unit Serial Number Page
Device Identification Page Code	6		Always 83h, the page code of the Device Identification Page
SCSI Firmware Revision Page Code	7		Always C0h, the page code of the SCSI Firmware Revision Page
Servo Firmware Revision Page Code	8		Always C1h, the page code of the Servo Firmware Revision Page
Head Assembly Serial Number Page	9		Always C2h, the page code of the Head Assembly Serial Number Page.
Reel Motor 1 Serial Number Page	10		Always C3h, the page code of the Reel Motor 1 Serial Number Page.
Reel Motor 2 Serial Number Page	11		Always C4h, the page code of the Reel Motor 2 Serial Number Page.
Board Serial Number Page	12		Always C5h, the page code of the Board Serial Number Page.
Base Mechanical Serial Number Page	13		Always C6h, the page code of the Base Mechanical Serial Number Page.
Drive Status Page	14		Always DFh, the page code of the current drive and cartridge state.

Unit Serial Number Page (80h)

The Unit Serial Number Page contains a single value, which is a 12 byte ASCII string. The string, with the Vendor Identification and Product Identification fields in the standard Inquiry data, uniquely identifies the drive.

Byte	**Bits** 7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	Page Code							
2	Reserved							
3	Page Length							
4-15	Drive Serial Number							

Field Descriptions

Field	Bytes	Bits	Description
Peripheral Qualifier	0	5-7	Always 000b.
Peripheral Device Type	0	0-4	Normally 01h to indicate a sequential access device. 7Fh in byte 0 indicates that a logical unit is not present. This value is returned when an invalid LUN is specified.
Page Code	1		Always 80h, indicating the Unit Serial Number Page
Reserved	2		Always 0
Page Length	3		Always 0Ch to indicate 12 additional bytes of data.
Drive Serial Number	4-15		12 bytes of ASCII data giving the unit serial number.

Device Identification Page (83h)

The Device Identification Page contains one or more device identification descriptors that uniquely identify the particular device. Viper FC returns four identifiers: Vendor, Node Name, Relative Port, and Port Name.

Byte	**Bits** 7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	Page code							
2	Reserved							
3	Page Length							
4-…	Identification Descriptor							
…-…	…							
…-…	Identification Descriptor							

Field Descriptions

Field	Bytes	Bits	Description
Peripheral Qualifier	0	5-7	Always 000b.
Peripheral Device Type	0	0-4	Normally 01h to indicate a sequential access device. 7Fh indicates that a logical unit is not present. This value is returned when an invalid LUN is specified.
Page Code	1		Always 83h, indicating the Device Identification Page
Reserved	2		Always 0
Page Length	3		*n*-3, indicating the total length of all Identification Descriptors following.

Field	Bytes	Bits	Description
Identifica-tion Descriptor	4-n		One or more Identification Descriptor. See the Identification De-scriptor data format below.

Identification Descriptor Data Format

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Reserved				Code Set			
1	Reserved		Association		Identifier Type			
2	Reserved							
3	Identifier Length							
4-n	Identification Descriptor							

Field Descriptions

Field	Bytes	Bits	Description
Code Set	0	0-3	1 = Identification Descriptor contains binary data.
			2 = Identification Descriptor contains ASCII data.
Identifier Type	1	0-3	1 = Identification Descriptor is Vendor ID and Product ID from Stan-dard Inquiry Data Page, followed by Serial Number from the Unit Serial Number Page.
			2 = Identification Descriptor is an IEEE Extended Unique Identifier.
			3 = Identification Descriptor is the Fibre Channel 64 bit Name Identi-fier
			4 = Relative target port (4 bytes)
Association	1	4-5	0 = Identifier field is associated with the addressed physical or logical device.
			1 = Identifier field is associated with the port that received the re-quest.
Identifier Length	3		*n*-3, indicating the length of this Identification Descriptor.
Identifica-tion De-scriptor	4-n		Binary or ASCII data (depending on Code Set).
Reserved			Always 0

Drive Component Revision Levels Pages (C0h, C1h)

The Drive Component Revision Levels Pages contain details of the revisions of each of the components of the drive. For any given product, if these pages are the same then the drive has been built with the same components and with the same manufacturing process.

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	Page Code							
2	Reserved							
3	Page Length							
4–29	Component							
30–48	Version							
49–72	Date							
73–95	Variant							

Field Descriptions

Field	Bytes	Bits	Description
Peripheral Qualifier	0	5-7	Always 000b.
Peripheral Device Type	0	0-4	01h, indicating a sequential access device.
Page Code	1		C0h = SCSI Firmware Revision Page C1h = Servo Firmware Revision Page
Reserved	2		Always 0
Page Length	3		Always 5Ch
Component	4-29		26 bytes of ASCII data, identifying the component. "SCSI FIRMWARE" = SCSI Firmware Revision Page "SERVO FIRMWARE" = Servo Firmware Revision Page
Version	30-48		19 bytes of ASCII data, "VNNNN-MMM"
Date	49–72		24 bytes of ASCII data, "YYYY/MM/DD" YYYY = 4 digits of year MM = 2 digits of month DD = 2 digits of day
Variant	73–95		23 bytes of ASCII data

Drive Component Serial Number Page (C2,C3,C4,C5,C6h)

The Drive Component Serial Number Page contains a single value, which is a 12 byte ASCII string. The string, with the drive component fields in the standard Inquiry data, uniquely identifies the component.

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Peripheral Qualifier			Peripheral Device Type				
1	Page code							
2	Reserved							
3	Page Length							
4-15	Component Serial Number							

Field Descriptions

Field	Bytes	Bits	Description
Peripheral Qualifier	0	5-7	Always 000b.
Peripheral Device Type	0	0-4	Normally 01h to indicate a sequential access device.
Page Code	1		C2h, indicating the Head Assembly Serial Number Page C3h, indicating the Reel Motor 1 Serial Number Page C4h, indicating the Reel Motor 2 Serial Number Page C5h, Board Serial Number Page C6h, Base Mechanical Serial Number Page
Reserved	2		Always 0
Page Length	3		Always 0C to indicate 12 additional bytes of data.

Field	Bytes	Bits	Description
Drive Serial Number	4-15		12 bytes of ASCII data giving the unit serial number.

Drive Status Page (DFh)

The Drive Status Page provides a snapshot of the current state of the drive and cartridge. It provides an extract of selected mode and log pages. The page code is DFh

	Bits							
Byte	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	Peripheral Qualifier			Peripheral Device Type				
1	Page Code							
2	Reserved							
3	Page Length							
4	Drive State							
5	CmdFwd		Alerts	Rsvd	NoRe-mov	Unit Rsvd	Rsvd	Clean
6	Reserved			Thread-ed	Lun1-Cmd	Autoload Mode		
7	Reserved							
8	Cartridge Type							
9	Cartridge Format (0)							
10	Cartridge Capacity, MSB							
11	Cartridge Capacity, LSB							
12	Port A Transport Type							
13	Port A Selection ID, MSB							
14	Port A Selection ID							
15	Port A Selection ID, LSB							
16	Port B Transport Type							
17	Port B Selection ID, MSB							
18	Port B Selection ID							
19	Port B Selection ID, LSB							
20	Operating Hours Since Manufacture, MSB							
21	Operating Hours Since Manufacture							
22	Operating Hours Since Manufacture							
23	Operating Hours Since Manufacture, LSB							
24-31	Initiator ID							
32-63	Cartridge Serial Number							

Field Descriptions

Field	Bytes	Bits	Description
Peripheral Qualifier	0	5-7	Always 000b.
Peripheral Device Type	0	0-4	01h, indicating a sequential access device.
Page Code	1		Always DFh, indicating the Drive Status Page
Page Length	3		Always 3Ch

Field	Bytes	Bits	Description
Drive State	4		Contains one of the values shown in the Drive State Field Values table below.
Cmd Fwd	5	6-7	0 = Command Forwarding is disabled.
			1 = Command Forwarding is enabled.
			Command Forwarding is controlled by the Interface Control Mode Page
Alerts	5	5	0 = Alerts are disabled.
			1 = Alerts are enabled. (Alerts are not implemented, so this field never has a value of 1.)
			Alerts would be controlled by the Interface Control Mode Page
NoRemov	5	3	0 = Removal of the cartridge is enabled
			1 = Removal of the cartridge has been disabled with the Prevent/Allow Medium Removal command.
Unit Rsvd	5	2	0 = The unit is not reserved. The Initiator Selection Address field is invalid.
			1 = An initiator has reserved the device. The Initiator Selection Address field contains the Selection Address of the initiator.
Clean	5	0	0 = Cleaning is not needed.
			1 = Cleaning is needed.
Threaded	6	4	0 = Tape is not threaded.
			1 = Tape is threaded. (It may still be wrapping and not yet ready.)
Lun1Cmd	6	3	0 = No unforwarded command exists for LUN 1.
			1 = One or more LUN 1 commands are awaiting forwarding via RS-422.
Autoload Mode	6	2-0	0 = Load and thread when cartridge is inserted
			1 = Load and do not thread when cartridge is inserted
			2 = Do not load when cartridge is inserted
			Autoload Mode is controlled by the Control Mode Page
Cartridge Type	8		Contains one of the values shown in the Cartridge Type Field Values table below.
Cartridge Format	9		Always 0, indicating an LTO tape cartridge.
Cartridge Capacity	10-11		Uncompressed capacity of the cartridge, in multiples of 10^9 bytes.
Port A Transport Type	12		0 = Port A link is down.
			1 = Parallel SCSI Interface
			2 = Port A link is up at 1 Gbaud (Fibre Channel interface only)
Port A Selection ID	13-15		Parallel SCSI Interface:
			The SCSI ID to which the drive responds.
			Fibre Channel Interface:
			The current 24-bit ID of Port A.
Port B Transport Type	16		Parallel SCSI Interface:
			Always 0
			Fibre Channel Interface:
			0 = Port B link is down.
			2 = Port B link is up at 1 Gbaud.
Port B Selection ID	17-19		Parallel SCSI Interface:
			Always 0
			Fibre Channel Interface:
			The current 24-bit ID of Port B.

Field	Bytes	Bits	Description
Operating Hours Since Manufac-ture	20-23		Total number of hours of head-tape contact time.
Initiator ID	24-31		Identification of the initiator holding a reservation on the drive, when the Unit Rsvd field is one. If the interface is Parallel SCSI, then the least-significant byte contains the initiator's SCSI ID; if the interface is Fibre Channel, then the field contains the initiator's 64-bit world-wide ID. If Unit Rsvd is zero, then this field is zero.
Cartridge Serial Number	32-63		32 bytes of ASCII data, right-filled with blanks. This is the cartridge serial number as defined by attribute number 0201h of the SPC-2 Read Attribute command. [The SPC-2 Read Attribute command has not been implemented.]
Reserved			Always 0

As there is only one LTO format defined at this time, the Cartridge Format value is always zero. During insertion, the type of a data cartridge is unknown between the time the cartridge is seated and the drive completes winding to BOT; the length calculation takes place during winding.

Drive State Field Values

The Medium Auxiliary Memory (MAM) can be accessed only in the states indicated.

Value	State	Description	MAM Acces-sible
0	DRIVE NOT READY	No commands may be issued and cartridge may not be inserted.	N
1	DRIVE EMPTY READY	No cartridge in drive. Commands will be ac-cepted and a cartridge may be inserted.	N
2	DRIVE MEDIA LOADABLE	Cartridge is in carrier and loading may be initiated by issuing a SCSI Load or a library LOAD CARTRIDGE command.	N
3	DRIVE LOADING	Drive is loading and threading the cartridge.	N
4	DRIVE LOADED HOLD	Drive is loaded to Hold point.	Y
5	DRIVE LOADED READY	Drive can accept non-status commands.	Y
6	DRIVE WRITING	Drive cannot accept non-status commands.	Y
7	DRIVE READING	Drive cannot accept non-status commands.	Y
8	DRIVE BUSY	Drive cannot accept non-status commands.	Y
9	DRIVE UNLOADING	Tape is being unthreaded and ejected.	Y
10	DRIVE MEDIA REMOVABLE	Cartridge has been ejected and is ready for extraction by the library.	N
11	DRIVE LOAD FAILED EJECTED	Loading failed and the cartridge was re-turned to the loadable/removable position.	N
12	DRIVE LOAD FAILED JAMMED	Loading failed.	N
13	DRIVE LOAD FAILED HOLD	Loading failed and the cartridge is in the drive at the Hold position.	Y
14	DRIVE EJECT FAILED JAMMED	Ejection failed.	N
15	DRIVE EJECT FAILED HOLD	Ejection failed and the cartridge is in the drive at the Hold position.	Y
16	DRIVE STATE UNKNOWN.		N
17	DRIVE CLEANING FAILED	Cleaning cartridge expired or cleaning failed for another reason. Tape may be threaded.	Y

Cartridge Type Field Values

Value	Meaning
0	Empty – no cartridge is present
1	Cleaning cartridge
2	Unknown data cartridge
3	Firmware cartridge
4	Ultrium Type A data cartridge
5	Ultrium Type B data cartridge
6	Ultrium Type C data cartridge
7	Ultrium Type D data cartridge

Completion Status

Code	Message	Description		
00h	Good Status	♦ The tape is not moved; the current position is maintained. ♦ The drive remains in any previously set modes. ♦ The drive is ready to perform any appropriate command.		
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:		
		Code	**Message**	**Description**
		04h	Hardware Error	Parity error on the SCSI bus or drive hardware failure.
		05h	Illegal Request	The Command Descriptor Block is invalid.

LOAD UNLOAD

The Load Unload command may be used to load or unload a cartridge. This command may also be used to request that the retension function be performed.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (1Bh)							
1	Ignored LUN			Reserved				Immed
2	Reserved							
3	Reserved							
4	Reserved				Hold	EOT	Reten	Load
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for the Load Unload command is 1Bh.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Immed	1	0	0 = Status is not returned until the operation has completed.
			1 = Status is returned as soon as buffered data and filemarks are written to the medium and the CDB has been validated.
Hold	4	3	1 = Requests that the medium be positioned to the Medium Auxiliary Memory Accessible position where the medium is seated into the drive but the tape is not threaded to BOT.
EOT	4	2	Not supported. Must be set to 0.
Reten	4	1	1 = Requests that the retension function be performed on medium.
Load	4	0	0 = requests that the medium be unloaded.
			1 = requests that the medium be loaded.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

The drive has three possible states where the medium may be positioned. The locations are:

- The Medium Loadable Position where the medium is inserted into the drive but has not been seated into the drive and the tape has not been threaded to BOT.

- The Medium Auxiliary Memory Accessible Position where the medium has been seated into the drive but the tape has not been threaded to BOT.

- The Medium Loaded And Ready Position where the medium has been seated into the drive and the tape has been threaded to BOT. The medium is ready to use.

Medium Loadable Position

Hold	Reten	Load	Description
0	0	0	No action taken, Good Status is returned.
0	0	1	Load the medium to the Loaded position. The medium will be ready at BOT.
0	1	0	Check condition, sense data 02/3A/03.
0	1	1	Load the medium to the Loaded position and perform the retension operation. The medium will be ready at BOT.
1	0	0	Load the medium to the Medium Auxiliary Memory Accessible position.
1	0	1	Load the medium to the Medium Auxiliary Memory Accessible position.
1	1	0	Check condition, sense data 02/3A/03.
1	1	1	Check condition, sense data 02/3A/03.

Medium Auxiliary Memory Accessible Position

Hold	Reten	Load	Description
0	0	0	Unload the medium to the Loadable position.
0	0	1	Load the medium to the Loaded position. The medium will be ready at BOT.
0	1	0	Check condition, sense data 02/3A/04.
0	1	1	Load the medium to the Loaded position and perform the retension operation. The medium will be ready at BOT.
1	0	0	No action taken, Good Status is returned.
1	0	1	No action taken, Good Status is returned.
1	1	0	Check condition, sense data 02/3A/04.
1	1	1	Check condition, sense data 02/3A/04.

Medium Loaded And Ready Position

Hold	Reten	Load	Description
0	0	0	Unload the medium to the Loadable position.
0	0	1	Rewind the medium to the Loaded position. The medium will be ready at BOT.
0	1	0	Perform the retension operation and unload the medium to the Loadable position.
0	1	1	Perform the retension operation. The medium will remain at the Loaded position ready at BOT.
1	0	0	Unload the medium to the Medium Auxiliary Memory Accessible position.
1	0	1	Unload the medium to the Medium Auxiliary Memory Accessible position.
1	1	0	Perform the retension operation and unload the medium to the Medium Auxiliary Memory Accessible position.
1	1	1	Perform the retension operation and unload the medium to the Medium Auxiliary Memory Accessible position.

If the Prevent Medium Removal state has been set using the Prevent Allow Medium Removal command and a Load Unload command is issued that requests the medium be unloaded to the Medium Loadable position, then a check condition status will be returned. The sense key will be set to Illegal Request(05) and the additional sense data will be set to Medium Removal Prevented (5302).

If the Immediate (Immed) flag is 1, then the drive validates the command and waits for any previous command from any host to complete, including any immediate commands currently being processed, and for any buffered data to be flushed to

tape. It will then report a deferred error for any preceding command or buffered data if appropriate. If there is no deferred error, the drive reports good status and initiates the command. If the Immediate flag is 0, status is not returned until after the command has completed.

Completion Status

Code	Message	Description
00h	Good Status	♦ The tape is positioned as requested. ♦ The drive remains in any previously set modes. ♦ The drive is ready to perform any appropriate command. Note: If IMMED is one, then Good status only indicated that the command is valid.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 02h Not Ready No cartridge is in the drive, cartridge is in the Loadable position or the cartridge is in the Medium Auxiliary Memory Accessible Position 04h Hardware Error Parity error on then SCSI bus, or drive hardware failure detected. 05h Illegal Request Medium Removal Prevention has been set, or the command Descriptor Block is invalid. 06h Unit Attention The cartridge was loaded or unloaded to the Medium Loadable, Medium Auxiliary Memory Accessible Or Medium Loaded at BOT positions.

LOCATE

The Locate command moves to a specified position on the tape.

Before the locate operation is performed, all buffered data and filemarks are transferred to tape. On completion, the logical position is before the specified location.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (2Bh)							
1	Ignored LUN			Reserved				Immed
2	Reserved							
3	Block Address, MSB							
4	Block Address							
5	Block Address							
6	Block Address, LSB							
7	Reserved							
8	Reserved							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The operation code for Locate is 2Bh
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Immed	1	0	0 = Status is not returned until the tape is positioned. 1 = Status is returned as soon as the operation is initiated.
Block Address	3-6		The logical block address of the block to which the tape is to be positioned. Block 0 is the first block on tape. The value indicates the total number of records and marks between BOT and the desired logical position.
Reserved			All reserved bits must be 0.
Control	9		See Control Byte Format on page 20.

The Locate command causes the logical position on tape to be set to the value indicated by the Block Address field. The value indicates the total number of records and marks between BOT and the desired logical position. A value of 0 will cause the tape to be positioned at BOT.

If the Immediate (Immed) flag is set to 1, then the drive validates the command and waits for any previous command from any host to complete including any immediate commands currently being processed and for any buffered data to be flushed to tape. It will then report a deferred error for any preceding command or buffered data if appropriate. If there is no deferred error, the drive reports good status and initiates the command. If the Immediate (Immed) flag is set to 0, status is not returned until after the command has completed.

Completion Status

Code	Message	Description
00h	Good Status	♦ The tape is positioned to the logical block address specified. ♦ The drive remains in any previously set mode. ♦ The drive is ready to perform any appropriate command. Note: If Immed is 1, then Good Status only indicates that the command is valid.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:

Code	Message	Description
02h	Not Ready	No cartridge is in the drive.
03h	Media Error	Unrecoverable data error encountered.
04h	Hardware Error	Parity error on SCSI bus or drive hardware failure detected.
05h	Illegal Request	The Command Descriptor Block is invalid.
06h	Unit Attention	The cartridge was changed, or the drive was reset prior to this command.
08h	Blank Check	The drive encountered EOD.

LOG SELECT

The Log Select and Log Sense commands work in conjunction to allow the host to control and obtain statistical information about cartridge usage and error rates. This information consists of counters of particular events.

The Log Select command is used to reset the log counters to their default values. A SCSI Bus Reset, Bus Device Reset, or cartridge loading is also used to reset these counters (of pages 02h, 03h, 0Ch, and 32h.) Multiple pages are reset by a single Log Select command. Log Select affects pages 02h, 03h, 2Eh, and 32h only. See Log Sense for information about log pages and their format.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (4Ch)							
1	Ignored LUN			Reserved			PCR	Rsvd
2	PC		Reserved					
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	Parameter List Length, MSB							
8	Parameter List Length, LSB							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Log Select is 4Ch
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Parameter Code Re- set (PCR)	1	1	0 = Reset values as specified by PC. Do not clear the DU (Disable Update, see **Log Parameter**) bits of the parameters of log pages 02h, 03h, 2Eh, and 32h. With page 2Eh log parameters are set to 0 only when PC = 11b. 1 = Reset log parameters on pages 02h, 03h, 2Eh, and 32h. All ac- cumulated values are set to 0; all threshold values are set to maximums except page 2Eh. DU bits of the parameters of these log pages are also cleared.
Page Control (PC)	2	6-7	00b = Check Condition if Parameter List Length > 0. 01b = Check Condition if Parameter List Length > 0. 10b = All thresholds are set to maximums. Check Condition if Pa- rameter List Length > 0. 11b = All accumulated values are set to 0. Check Condition if Pa- rameter List Length > 0. This field is ignored if PCR is not 0.
Parameter List Length	7-8		Always 0. Specifies the length (in bytes) of the parameter list to be transferred during the Data Out phase. A 0 length indicates that no parameter data is to be transferred.
Reserved			All reserved bits must be 0.

Field	Bytes	Bits	Description
Control	9		See Control Byte Format on page 20.

Note: Pages 00h, 0Ch, 30h, and 31h cannot be reset by Log Select.

The drive does not maintain a separate set of log parameters for each initiator. Therefore, a Log Select command affects all initiators.

Note: The subsequent section discusses the Log Sense command. The log page codes and the log parameter codes are described in that section.

Log Pages

A log page is made up of a four-byte page header and one or more log parameters. A log parameter is made up of a four-byte parameter header and one or more associated parameter data bytes.

The following table shows the log page header format.

	Bits							
Byte	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	Reserved		Page Code					
1	Reserved							
2	Page Length, MSB							
3	Page Length, LSB							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	Identifies the page.
Page Length	2-3		Indicates the length of log parameters (in bytes) which follow the page header.
Reserved			All reserved bits must be 0.

Log Parameter

The following table shows a typical log parameter format.

	Bits							
Byte	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	Parameter Code, MSB							
1	Parameter Code, LSB							
2	DU	DS	Reserved					
3	Parameter Length (n-3)							
4	Parameter Value							
n	Parameter Value							

Field Descriptions

Field	Bytes	Bits	Description
Parameter Code	0-1		Identifies the log parameter. Log Parameters are always in ascending order.
Disable Update (DU)	2	7	0 = Enables update of accumulated value when the corresponding event occurs.
			1 = Disables update of all accumulated values within a log page when the corresponding event occurs. The drive sets this bit to indicate that the accumulated value of the parameter has reached its maximum value so that the drive can no longer increment any Parameter Values.
Disable Save (DS)	2	6	Always 1, indicating that the drive does not support Save Page in Log Sense and Log Select.
Parameter Length	3		n – 3, indicating the length of the Parameter Value.
Parameter Value	4 - n		Actual data.
Reserved			Always 0.

The parameter header contains a two-byte parameter code to identify the parameter, a Parameter Control byte, and a parameter length byte.

All of the bits in byte 2 of the Log Parameter are collectively referred to as the Parameter Control byte. The Parameter Control byte specifies counter controls.

The Parameter Control byte specifies:

- Whether or not a counter or a log page is enabled.

- Whether or not a Check Condition is generated when a counter is incremented, and if so, how the Check Condition is generated.

Each Log Parameter contains only one control byte. This control byte is shared between the threshold and accumulated parameters. The Log Sense data reflects the current setting of the control byte for the parameter.

There are several logs of different formats that allow you to retrieve different drive parameters. The following logs are supported:

Log	See Page
Supported Log Pages Log	47
Write Error Counters Log	48
Read Error Counters Log	49
Sequential Access Device Log	49
Tape Alert Log	50
Tape Usage Log	50
Tape Capacity Log	51
Data Compression Log	52

Maximum Counts

The maximum value of each counter depends on the size of the counter in bytes. When the maximum count is reached, the DU bit in the Parameter Control byte for the counter is set to 1 for the Log Sense data indicating that the parameter is no longer to be updated by the drive because the maximum count has been reached

and if RLEC (Report Log Exception Condition) bit in Mode Page 0Ah (Control Mode page) is set to 1, Recovered Error/Log Counter at Maximum (01/5B/02) is returned to host to inform of the log exception. Bytes 15-17 of the Request Sense data specify the page, MSB and LSB of the Parameter Code respectively, which caused the Log Exception.

When a counter reaches the maximum, the counter is no longer incremented. If a maximum value for the parameter size is reached, the count does NOT roll over and continue counting. When any counter of a page reaches maximum, all counters of that page are no longer incremented. A Log Select command can be issued for pages 02h, 03h, and 32h with the PCR bit set to reset the accumulated values and to allow counters to continue as normal. The DU bit of the affected parameter is also reset to zero. The same effect can be achieved by a SCSI Bus Reset, Bus Device Reset, or cartridge loading.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The affected log parameters are reset. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:

		Code	Message	Description
		04h	Hardware Error	Parity error on the SCSI bus or drive hardware failure.
		05h	Illegal Request	The Reserved bits are set or the Parameter List Length is not 0 in the Command Descriptor Block.
		06h	Unit Attention	The cartridge was changed, or the drive was reset prior to this command.

LOG SENSE

The Log Select and Log Sense commands work in conjunction to allow the host to control and obtain statistical information about cartridge usage and error rates. This information consists of counters of particular events.

Log Sense data is obtained by specifying a log page in the Page Code field of the Log Sense CDB. The host can request only one page of data with each Log Sense command. The available pages are found by reading the Supported Log Pages Log (00h).

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (4Dh)							
1	Ignored LUN			Reserved				
2	PC			Page Code				
3	Reserved							
4	Reserved							
5	Parameter Pointer, MSB							
6	Parameter Pointer, LSB							
7	Allocation Length, MSB							
8	Allocation Length, LSB							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Log Sense is 4Dh.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Page Control (PC)	2	6-7	00b = Requests Threshold values (always returns maximum possible values). 01b = Requests Accumulated values 10b = Requests Default threshold values (always returns maximum possible values). 11b = Requests Default accumulated values (always returns 0s).
Page Code	2	0-5	00h = Requests Supported Log Pages Log 02h = Requests Write Error Counters Log 03h = Requests Read Error Counters Log 0Ch = Requests Sequential Access Device Log 2Eh = Requests Tape Alert Log 30h = Requests Tape Usage Log 31h = Requests Tape Capacity Log 32h = Requests Data Compression Log
Parameter Pointer	5-6	7-0	Specifies the beginning parameter code to be returned to the initiator. All remaining parameter codes are returned in ascending order. This field is ignored for page code 00h.

Field	Bytes	Bits	Description
Allocation Length	7-8	7-0	The Allocation Length field specifies the maximum amount of memory space (in bytes), which the initiator has reserved for Log Sense data. The drive returns the number of bytes contained in the requested page, or the requested Allocation Length, whichever is less. If the Allocation Length is less than the actual page length, the transfer is truncated.
Reserved			All reserved bits must be 0.
Control	9		See Control Byte Format on page 20.

The Page Control (PC) field specifies the type of counters that the initiator is requesting. The value 01b is the most common page control setting. This requests the accumulated counts for the page to be returned. These counts reflect the current count of events since the last power-on cycle, SCSI bus Reset, Bus Device Reset, cartridge loading, or the last Log Select command that cleared the parameter values.

Accumulated values are incremented by the drive as an event occurs. For pages 02h, 03h, and 32h, these values can be cleared with all the above methods. For page 0Ch these values can be cleared with all the above methods except with Log Select. Because the drive maintains the accumulated values in volatile memory, the values may be lost if a power cycle occurs.

The PC field is ignored for pages 00h, 0Ch, 2Eh, 30h, and 31h and the accumulated values are always returned except page 00h which has no accumulated values.

The Parameter Pointer Field

The Parameter Pointer field specifies the starting page that is to be transferred. For example, if the page uses parameter codes 2 through 6 and the parameter pointer field is set to 3, then the drive returns parameters 3 through 6. Likewise, if the parameter pointer is set to 1, parameters 2 through 6 are returned.

If the Parameter Pointer field is set to 0, all parameters for that particular page are returned up to the maximum number of bytes specified in the allocation length.

Regardless of the starting parameter code specified in the Parameter Pointer field, the page header is always returned.

Log Pages

There are several logs of different formats that allow you to retrieve different drive parameters. The following logs are supported:

Log	See Page
Supported Log Pages Log	47
Write Error Counters Log	48
Read Error Counters Log	49
Sequential Access Device Log	49
Tape Alert Log	50
Tape Usage Log	50
Tape Capacity Log	51
Data Compression Log	52

Only one log page is transferred to the host with each Log Sense command. The Page Code field (Byte 2) of the CDB specifies the page to be transferred.

A four-byte page header precedes the parameter data for each page. The page header specifies the page code returned and the length of that page in bytes.

Following the page header are the log parameters. Each log parameter is a data structure that contains several description bytes followed by the parameter value itself.

Log Page Header
First Log Parameter
…
Last Log Parameter

Log Page Header is always returned.

Multiple Log Parameters are returned in each log page. The log parameters are returned in ascending order.

Log Page Header

	Bits							
Byte	7	6	5	4	3	2	1	0
0	Reserved		Page Code					
1	Reserved							
2	Page Length, MSB							
3	Page Length, LSB							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	Identifies the page being returned.
Page Length	2-3		Indicates the length of the page in bytes that follow the page header. If the allocation length specified in the CDB is too small to transfer the entire requested page, this value is not adjusted to reflect the truncation. However, if the Parameter Pointer field specifies a starting parameter code other than zero, the page length is adjusted to indicate the number of bytes that follow the page header.
Reserved			All reserved bits must be 0.

Log Parameter

	Bits							
Byte	7	6	5	4	3	2	1	0
0	Parameter Code, MSB							
1	Parameter Code, LSB							
2	DU	DS	TSD	ETC	TMC		LBIN	LP
3	Parameter Length							
4 – n	Parameter Value							

Field Descriptions

Field	Bytes	Bits	Description
Parameter Code	0-1		Identifies the log parameter returned. Log Parameters are always returned in ascending order.
Disable Update (DU)	2	7	0 = Enables update of accumulated value when the corresponding event occurs. 1 = Disables update of all accumulated values within a log page when the corresponding event occurs. The drive sets this bit to indicate that the accumulated value of the parameter has reached its maximum value so that the drive can no longer increment any Parameter Values.
Disable Save (DS)	2	6	Always 1, indicating that the drive does not support Save Page in Log Sense and Log Select.
TSD	2	5	Always 0, indicating that Target Save Disable (TSD) is not supported.
ETC	2	4	Always 0, indicating that Enable Threshold Comparison (ETC) is not supported.
TMC	2	2-3	Always 0, indicating that Threshold Met Criteria (TMC) is not supported.
List Binary (LBIN)	2	1	Always 0, indicating that all log parameters are data counters.
List Parameter (LP)	2	0	Always 0, indicating that all log parameters are data counters.
Parameter Length	3		n – 3, indicating the length of the Parameter Value.
Parameter Value	4 – n		The Parameter Value is the actual data requested.
Reserved			Always 0.

Supported Log Pages Log (00h)

Page 00h indicates the log pages used by the drive. To determine the size of each page and of each parameter in the page, the individual page must be requested. Page 00h is unique in that the log parameters returned do not contain log parameter headers. All other pages return a log parameter header for each log parameter. Page 00h is valid only for the Log Sense command. When page 00h is requested, the four-byte page header is returned followed by the list of log pages—one byte for each log page. The list of log pages is returned in ascending order.

Byte	Bits 7	6	5	4	3	2	1	0
0	Reserved		Page Code (00h)					
1	Reserved							
2	Page Length, MSB							
3	Page Length, LSB (0Ah)							
4	Supported Log Pages Log (00h)							
5	Write Error Counters Log (02h)							
6	Read Error Counters Log (03h)							
7	Sequential Access Device Log (0Ch)							
8	Tape Alert Log (2Eh)							
9	Tape Usage Log (30h)							
10	Tape Capacity Log (31h)							
11	Data Compression Log (32h)							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	
Page Length	2-3		Always 0Ah, indicating the page length.
Supported Log Pages Log	4		Always 00h, the page code of the Supported Log Pages Log
Write Error Counters Log	5		Always 02h, the page code of the Write Error Counters Log
Read Error Counters Log	6		Always 03h, the page code of the Read Error Counters Log
Sequential Access Device Log	7		Always 0Ch, the page code of the Sequential Access Device Log
Tape Alert Log	8		Always 2Eh, the page code of the Tape Alert Log
Tape Us-age Log	9		Always 30h, the page code of the Tape Usage Log
Tape Ca-pacity Log	10		Always 31h, the page code of the Tape Capacity Log
Data Compres-sion Log	11		Always 32h, the page code of the Data Compression Log
Reserved			Always 0.

Write Error Counters Log (02h)

The Write Error Counters Log records write errors. The parameters on this page can be reset to 0 with the Log Select command.

Page Code	Page Length
02h	38h

Parameter	Description	Length
0	Errors corrected without substantial delay	4
1	Errors corrected with possible delay.	4
2	Total rewrites. (sum of Parameter 0003 and Parameter 0006)	4
3	Total errors corrected. This is total write retries less total unrecoverable write errors. (Parameter 0004 minus Parameter 0006, this is also the sum of Parameter 0000 and Parameter 0001)	4
4	Total times error correction processed. This is the total number of write retries.	4
5	Total bytes processed. The is the total data sets written.	4
6	Total uncorrected errors. This is the total unrecoverable write errors.	4

Read Error Counters Log (03h)

The Read Error Counters Log records read errors. The parameters on this page can be reset to 0 with the Log Select command.

Page Code	Page Length
03h	38h

Parameter	Description	Length
0	Errors corrected without substantial delay	4
1	Errors corrected with possible delay.	4
2	Total rereads. (sum of Parameter 0003 and Parameter 0006)	4
3	Total errors corrected. This is total read retries less total unrecoverable errors. (Parameter 0004 minus Parameter 0006, this is also the sum of Parameter 0000 and Parameter 0001)	4
4	Total times error correction processed. This is the total number of read retries.	4
5	Total bytes processed. The is the total data sets read.	4
6	Total uncorrected errors. This is the total unrecoverable read errors.	4

Sequential Access Device Log (0Ch)

The Sequential Access Device Log tracks the flow of data to and from the drive. It also signals when drive cleaning is necessary.

Page Code	Page Length
0Ch	3Ch

Parameter	Description	Length
0000h	Number of data bytes received from application clients during Write Command operations. This is the number of bytes transferred over the SCSI interface before compression.	8
0001h	Number of data bytes written to the media as a result of Write Command operations, not counting ECC and formatting overhead. This is the number of data bytes transferred to media after compression.	8
0002h	Number of data bytes read from the media during Read command Operations, not counting ECC and formatting overhead. This is the number of data bytes transferred from media with compression.	8
0003h	Number of data bytes transferred to the initiator(s) during Read Command operations. This is the number of bytes transferred over the SCSI interface, after decompression.	8
0100h	Cleaning required. A non-zero value of the cleaning required parameter indicates that a condition requiring cleaning has been detected and a subsequent cleaning cycle has not been completed. The cleaning required parameter is persistent across hard resets and power cycles.	8

Tape Alert Log (2Eh)

The Tape Alert Log Page provides information about errors and the status of the drive and media.

Page Code	Page Length
2Eh	140h

All parameters are one byte long. Each parameter is either zero to indicate the corresponding condition has not occurred or one to indicate that the corresponding condition has occurred. The log page is used in conjunction with Information Exceptions Mode Page (1Ch) that controls the action taken by the drive when a flag is set and sets various other control mechanisms of the Tape Alert system. A flag is set whenever the condition for setting the flag exists. There are three types of flags, Informational, Warning, and Critical. The type of flag depends upon the severity of the condition that sets the flag. Flags are cleared on the following conditions:

- At drive power on
- When the TapeAlert Log page is read
- When specified corrective action has been taken (such as using a cleaning cartridge)
- On a SCSI bus reset or bus device reset message
- On Log Select reset (note that the recommended action on receiving Log Select for the TapeAlert Log page is to reject the command with an error).

Additional information regarding the Tape Alert system is found in the SCSI-3 Stream Commands (SSC) Standard and Tape Alert specification. The following is the list of flags (parameters) supported by the drive.

Parameter	Description	Type	Length
3	Hard Error	Warning	1
9	Write Protect	Critical	1
11	Cleaning media in drive	Informational	1
14	Unrecoverable snapped tape	Critical	1
15	Memory in Cartridge Failure	Warning	1
16	Forced Eject	Critical	1
17	Read Only Format	Warning	1
18	Tape Directory Corrupted on Load	Warning	1
20	Clean now	Critical	1
22	Expired cleaning media	Critical	1
23	Invalid cleaning tape	Critical	1
30	Hardware A	Critical	1
31	Hardware B	Critical	1
32	Interface	Warning	1
34	Download Fault	Warning	1
51	Tape Directory Invalid at Unload	Warning	1

Tape Usage Log (30h)

The Tape Usage Log Page returns information about the current tape cartridge. These values are all read directly from the tape log. The Page Control, PC, field is ignored and accumulated values are always returned.

Page Code	Page Length
30h	5Ah

Parameter	Description	Length
1	Thread Count	4
2	Total Data Sets Written	8
3	Total Write Retries	4
4	Total Unrecovered Write Errors	2
5	Total Suspended Writes	2
6	Total Fatal Suspended Writes	2
7	Total Data Sets Read	8
8	Total Read Retries	4
9	Total Unrecovered Read Errors	2
10	Reserved	2
11	Reserved	2
12	Total Suspended Append Writes	2

Tape Capacity Log (31h)

The Tape Capacity Log returns information about the tape capacity. All values are in millions of bytes (10^6) and assume no data compression. The Page Control, PC, field is ignored and accumulated values are always returned.

Page Code	Page Length
31h	20h

Parameter	Description	Length
1	Main partition remaining capacity	4
2	Always 0	4
3	Main partition maximum capacity	4
4	Always 0	4

Data Compression Log (32h)

The Data Compression Log records compression information. The parameters on this page can be reset to 0 with the Log Select command

Page Code	Page Length
32h	4Ch

Parameter	Description	Length
0	Read compression ratio in percent	2
1	Write compression ratio in percent	2
2	Millions of total bytes transferred to host	4
3	Remaining bytes of total bytes transferred to host	4
4	Millions of total bytes read from tape	4
5	Remaining bytes of total bytes read from tape	4
6	Millions of total bytes transferred from host	4
7	Remaining bytes of total bytes transferred from host	4
8	Millions of total bytes written to tape	4
9	Remaining bytes of total bytes written to tape	4

Parameters 2 through 9 occur as pairs each of which represents a total number of bytes (i.e., total number of bytes transferred to host as with Parameter 2 and 3 pair.) The first four-byte parameter of a pair represents millions of bytes (10^6.) The second four-byte parameter of a pair represents the difference between the millions of bytes and the total number of bytes as a positive number in the range of 0 to 999,999. Thus the total number of bytes is the first four-byte parameter in bytes plus the second four-byte parameter. Parameters 0 and 1are in percent, i.e. 200 represents 200% compression. Compression ratios will be most accurate after 10^8 bytes have been read or written.

Completion Status

Code	Message	Description		
00h	Good Status	• The drive is ready to perform any appropriate command. • The requested log page is returned. • The tape position is not changed.		
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:		
		Code	**Message**	**Description**
		04h	Hardware Error	Parity error on the SCSI bus or drive hardware failure.
		05h	Illegal Request	The Command Descriptor Block is invalid.
		06h	Unit Attention	The cartridge was changed, or the drive was reset prior to this command.

MODE SELECT

The Mode Select command allows the host to assign device parameters to the drive.

After a power-on or SCSI reset condition, the drive sets its device parameters to the default values. By issuing a Mode Select command, the host can change the device parameters. The parameters are transferred to the drive as data formatted in a parameter list.

Parameters assigned by the Mode Select command remain in effect until the drive receives a subsequent Mode Select command or a reset. The Mode Select parameters are not unique to the initiator that assigned the parameters.

In multiple-initiator systems, all initiators that access the drive use the assigned parameters. However, when a Mode Select command changes parameters that apply to other initiators, the drive generates a Unit Attention condition for all initiators except the one that issued the Mode Select command. The Additional Sense Code and Additional Sense Code Qualifier are set to Mode Parameters Changed.

The Mode Select command immediately checks for invalid parameters or invalid combinations of parameters before executing. If an exception is found, the drive returns a Check Condition, and the request sense data is set to Illegal Request.

All Mode Select parameters may be rounded up or down, as appropriate. A Mode Sense command may be issued after a Mode Select command to determine which parameters have been rounded.

Command Descriptor Block

6-Byte Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (15h)							
1	Ignored LUN			PF	Reserved			
2	Reserved							
3	Reserved							
4	Parameter List Length							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	1		The Operation Code for Mode Select is 15h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
PF	1	4	Always 1, indicating SCSI-2 format.
Parameter List Length	4		Specifies the number of bytes in the Mode Select parameter list to be transferred from the host to the drive. A value of 0 is a valid entry and indicates no data.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

A value in the Parameter List Length field that truncates a parameter list causes the drive to return a Check Condition, and the request sense data is set to Illegal Request.

10-Byte Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (55h)							
1	Ignored LUN			PF	Reserved			
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	Parameter List Length, MSB							
8	Parameter List Length, LSB							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	1		The Operation Code for Mode Select is 55h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
PF	1	4	Always 1, indicating SCSI-2 format.
Parameter List Length	7-8		Specifies the number of bytes in the Mode Select parameter list to be transferred from the host to the drive. A value of 0 is a valid entry and indicates no data.
Reserved			All reserved bits must be 0.
Control	9		See Control Byte Format on page 20.

A value in the Parameter List Length field that truncates a parameter list causes the drive to return a Check Condition, and the request sense data is set to Illegal Request.

Mode Select Parameters

The Mode Select parameter list, for both the 6-byte CDB and 10-byte CDB versions is in the following general format:

Mode Parameter Header	The Mode Parameter Header is required.
Block Descriptor	The Block Descriptor is optional.
Mode Parameter Pages	Zero or more Mode Parameter Pages may be included.

Mode Parameter Header

6-Byte CDB Mode Parameter Header

Byte	Bits 7	6	5	4	3	2	1	0
0	Mode Data Length							
1	Reserved							
2	WP	Buffered Mode			Speed			
3	Block Descriptor Length							

Field Descriptions

Field	Bytes	Bits	Description
Mode Data Length	0		Mode Select: Always 0. Mode Sense: The number of bytes of data available.
WP	2	7	Mode Select: Ignored. Mode Sense: 0 = The cartridge is not write protected. 1 = the cartridge is write protected.
Buffered Mode	2	4-6	0 = Unbuffered mode. 1 = Buffered mode (default).
Speed	2	0-3	This field indicates the tape speed. 0 = Default 3 = 2.077 m/sec (meter/second) 4 = 2.576 m/sec 5 = 3.097 m/sec 6 = 3.643 m/sec 7 = 4.153 m/sec
Block Descriptor Length	3		0 = No Block Descriptor follows. 8 = 8-byte Block Descriptor follows.
Reserved			All reserved bits must be 0.

When Buffered Mode is 1, a Write command is terminated when the data is transferred to the internal buffer of the drive. When Buffered Mode is 0 a Write command is not terminated until all data has been transferred to tape.

10-Byte CDB Mode Parameter Header

Byte	Bits 7	6	5	4	3	2	1	0
0	Mode Data Length, MSB							
1	Mode Data Length, LSB							
2	Reserved							
3	WP	Buffered Mode			Speed			
4	Reserved							
5	Reserved							
6	Block Descriptor Length, MSB							
7	Block Descriptor Length, LSB							

Field Descriptions

Field	Bytes	Bits	Description
Mode Data Length	0-1		Mode Select: Always 0. Mode Sense: The number of bytes of data available.
WP	3	7	Mode Select: Ignored. Mode Sense: 0 = The cartridge is not write protected. 1 = the cartridge is write protected.
Buffered Mode	3	4-6	0 = Unbuffered mode. 1 = Buffered mode (default).
Speed	3	0-3	This field indicates the tape speed. 0 = Default 3 = 2.077 m/sec (meter/second) 4 = 2.576 m/sec 5 = 3.097 m/sec 6 = 3.643 m/sec 7 = 4.153 m/sec
Block Descriptor Length	6-7		0 = No Block Descriptor follows. 8 = 8-byte Block Descriptor follows.
Reserved			All reserved bits must be 0.

When Buffered Mode is 1, a Write command is terminated when the data is transferred to the internal buffer of the drive. When Buffered Mode is 0 a Write command is not terminated until all data has been transferred to tape.

Block Descriptor

The following table presents the Parameter List block descriptor.

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Density Code							
1	Reserved							
2	Reserved							
3	Reserved							
4	Reserved							
5	Block Length, MSB							
6	Block Length							
7	Block Length, LSB							

Field Descriptions

Field	Bytes	Bits	Description
Density Code	0		Identifies the format of the tape currently in the drive. Mode Select: 00h = Default of Ultrium 1 40h = Ultrium 1 7Fh = No-op Mode Sense: 00h = Default of Ultrium 1
Block Length	5-7		0 = Variable length block mode. The Fixed bit in Read and Write commands must be 0. 1 to FFFFFFh = The length of the fixed-length block to be read or written when the Fixed bit is set in a Read or Write command.
Reserved			All reserved bits must be 0.

Mode Parameter Pages

There are several mode parameter pages of different formats that allow you to set different drive parameters. The following mode parameter pages are supported:

Mode Parameter Page	See Page
Disconnect/Reconnect Page (02h)	58
Control Mode Page (0Ah)	59
Data Compression Control Page (0Fh)	60
Sequential Access Device Configuration Page (10h)	61
Information Exceptions Mode Page (1Ch)	62
Drive Capabilities Control Mode Page (21h)	65
Interface Control Mode Page (22h)	65

The following table shows the general format of a Mode Parameter Page.

Byte	Bits 7	6	5	4	3	2	1	0
0	Reserved		Page Code					
1	Additional Page Length							
2 - n	Mode Parameters							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	02h = Disconnect/Reconnect Page 0Ah = Control Mode Page 0Fh = Data Compression Control Page 10h = Device Configuration Page 1Ch = Information Exceptions Page 21h = Drive Capabilities Control Mode Page 22h = Interface Control Page
Additional Page Length	1		Specifies the length (in bytes) of the Mode Parameters.
Mode Parameters	2-n		The mode parameters are specific to each mode parameter page and are described in the following sections.
Reserved			All reserved bits must be o.

If the initiator does not set the Additional Page Length field of the Mode Page to the value indicated in the Mode Page definition (for example, 10h for the Device Configuration Page), the drive terminates the Mode Select command and returns Check Condition status bytes with an Illegal Request sense key. The Additional Sense Code and Additional Sense Code Qualifier are set to Invalid Field in Parameter List.

Disconnect/Reconnect Page

The Disconnect/Reconnect page allows the host to set the maximum burst size for data transfer.

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Reserved		Page Code (02h)					
1	Additional Page Length (0Eh)							
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							
8	Reserved							
9	Reserved							
10	Maximum Burst Size, MSB							
11	Maximum Burst Size, LSB							
12	Reserved							
13	Reserved							
14	Reserved							
15	Reserved							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	Always 02h, indicating the Disconnect/Reconnect Page
Additional Page Length	1		Always 0Eh, indicating that 14 parameter bytes follow the Page Length byte.
Maximum Burst Size	10-11		0 = No limit exists on the amount of data transferred per connection (default). The drive does not have to disconnect until all requested data is transferred. 1 to FFFFh = The maximum amount of data that the drive can transfer, in 512-byte increments, before disconnecting, if the initiator granted the disconnect capability.
Reserved			All reserved bits must be 0.

On read operations, the drive disconnects when the drive buffer is empty, even if the Allocation Length has not been satisfied. On write operations, the drive disconnects when the drive buffer is full, even if the Transfer Length has not been exhausted.

Control Mode Page

The Control Mode page specifies whether the drive generates a Check Condition when any log parameter reaches maximum. (Refer to the Log Select command and the Log Sense command.) It also specifies whether tagged queueing is used and the behavior of the drive autoload sequence.

Note that Autoload Mode persists across power cycles. Its new definition takes effect at the next cartridge insertion after Mode Select.

Byte	Bits 7	6	5	4	3	2	1	0
0	Reserved			Page Code (0Ah)				
1	Additional Page Length (06h)							
2	Reserved							RLEC
3	Reserved							DQUE
4	Reserved							
5	Reserved					Autoload Mode		
6	Reserved							
7	Reserved							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	Always 0Ah, indicating the Control Mode Page.
Additional Page Length	1		Always 06h, indicating that 6 parameter bytes follow the Page Length byte.
RLEC	2	0	0 = Drive does not Report Log Exception Conditions (RLEC) (default). 1 = Drive Reports Log Exception Conditions (RLEC).
DQUE	3	0	Always 1, indicating that Tagged Queuing (DQUE) is disabled.
Auto Load Mode	5	0-2	000b = Load inserted medium for full access. 001b = Load inserted medium for medium auxiliary memory access only. 010b = Do not load inserted medium.
Reserved			All reserved bits must be 0.

Data Compression Control Page

The Data Compression Control Page specifies whether or not data is compressed during Write commands and whether or not data is decompressed during Read commands.

Byte	Bits 7	6	5	4	3	2	1	0
0	Reserved		Page Code (0Fh)					
1	Additional Page Length (0Eh)							
2	DCE	DCC	Reserved					
3	DDE	RED		Reserved				
4	Compression Algorithm, MSB							
5	Compression Algorithm							
6	Compression Algorithm							
7	Compression Algorithm, LSB							
8	Decompression Algorithm, MSB							
9	Decompression Algorithm							
10	Decompression Algorithm							
11	Decompression Algorithm, LSB							
12	Reserved							
13	Reserved							
14	Reserved							
15	Reserved							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	Always 0Fh, indicating the Data Compression Control Page.
Additional Page Length	1		Always 0Eh, indicating that 14 parameter bytes follow the Page Length byte.
DCE	2	7	0 = Data compression is disabled. 1 = Data Compression is Enabled (DCE) (default). The drive compresses data before writing to tape.
DCC	2	6	Always 1, indicating that the drive is Data Compression Capable (DCC).
DDE	3	7	0 = Data decompression is disabled. Compressed data is not decompressed before it is transferred to the host. 1 = Data Decompression is Enabled (DDE) (default). The drive decompresses compressed data before sending it to the host.
RED	3	5-6	Always 0, indicating that when DDE is 1 and drive is unable to decompress compressed data from tape, it should return Check Condition.
Compression Algorithm	4-7		0 = Data is not compressed before it is written to tape (even if DCE is 1). 1 = Default compression algorithm (default).
Decompression Algorithm	8-11		0 = No algorithm is selected. 1 = Default decompression algorithm is used (default).
Reserved			All reserved bits must be 0.

Sequential Access Device Configuration Page

The Device Configuration page specifies the appropriate sequential access device configuration. The following table illustrates this page.

Byte	Bits 7	6	5	4	3	2	1	0
0	Reserved			Page Code (10h)				
1	Additional Page Length (0Eh)							
2	Rsvd	CAP	CAF	Active Format				
3	Active Partition							
4	Write Buffer Full Ratio							
5	Read Buffer Empty Ratio							
6	Write Delay Time, MSB							
7	Write Delay Time, LSB							
8	DBR	BIS	RSmk	AVC	SOCF		RBO	REW
9	Gap Size							
10	EOD Defined			EEG	SEW	Reserved		
11	Buffer Size at Early Warning, MSB							
12	Buffer Size at Early Warning							
13	Buffer Size at Early Warning, LSB							
14	Select Data Compression Algorithm							
15	Reserved							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	10h, indicating the Sequential Access Device Configuration Page.
Additional Page Length	1		Always 0Eh, indicating that 14 parameter bytes follow the Page Length byte.
CAP	2	6	Always 0, indicating that multiple partitions are not supported
CAF	2	5	Always 0, indicating that changing formats is not supported
Active Format	2	0-4	Always 0, indicating that changing formats is not supported
Active Partition	3		Always 0, indicating that multiple partitions are not supported
Write Buffer Full Ratio	4		Always 0, indicating that buffer management is handled by the drive.
Read Buffer Empty Ratio	5		Always 0, indicating that buffer management is handled by the drive.
Write Delay time	6-7		For a WRITE command, the Write Delay Time field indicates to the drive how long in 100 millisecond increments, to delay writing buffered data to tape after the last WRITE command.
DBR	8	7	Always 0, indicating that Data Buffer Recovery is not supported.
BIS	8	6	Always 1, indicating that Block Identifiers are Supported
RSmk	8	5	Always 0, indicating that Report Set Marks is not supported.
AVC	8	4	Always 0, indicating that Automatic Velocity Control is managed by the drive.
SOCF	8	2-3	Always 0, indicating that Stop On Consecutive Filemarks is not supported.
RBO	8	1	Always 0, indicating that Recover Buffer Order is not supported.
REW	8	0	Always 0, indicating that Report Early Warning for Read type commands is not supported.

Field	Bytes	Bits	Description
Gap Size	9		Always 0, indicating that there is no concept of inter-block gaps in the LTO format.
EOD Defined	10	5-7	Always 0, indicating the `logical unit's default EOD defi-nition`.
EEG	10	4	Always 1, indicating that EOD generation is always enabled.
SEW	10	3	Always 0, The Buffered Mode set in the Mode Select Parameter Header controls drive buffering.
Buffer Size at Early Warn-ing	11-13		Always 0, indicating that this cannot be set.
Select Data Compression Algorithm	14		0 = Use pass through mode; do not compress data (not recom-mended).
			1 = Use default auto-compression scheme (recommended default)
Reserved			All reserved bits must be 0.

Fibre Channel Logical Unit Control Mode Page (Fibre Channel drives only)

The Fibre Channel Logical Unit Control mode page contains those parameters that select FCP logical unit operation options, which only includes the enabling and disabling of precise delivery checking.

	Bits							
Byte	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	PS	Rsvd	Page Code (18h)					
1	Page Length 06h)							
2	Reserved				Protocol Identifier (FCP = 0h)			
3	Reserved							EPDC
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	18h, indicating the Fibre Channel Logical Unit Control Mode Page.
Page Length	1		06h, indicating that six parameter bytes follow the Page Length byte.
Protocol Identifier	2	0-4	0 = Fibre Channel Protocol for SCSI (FCP)
EPDC	3	0	0 = Disable Precise Delivery Checking
			1 = Enable Precise Delivery Checking
Reserved			All reserved bits must be 0.

Fibre Channel Port Control Mode Page (Fibre Channel drives only)

The Fibre Channel Port Control mode page contains those parameters that select FCP_Port operation options. The page is implemented by LUN 0 of the drive. Some of the bits defined by the Fibre Channel Port Control page require the FCP_Port to violate one or more of the Fibre Channel standards. The non-standard behaviors have been identified as useful for certain specialized operating environments. For this reason, all of the fields in bytes 3 – 7 are zero and cannot be changed.

Byte	Bits 7	6	5	4	3	2	1	0
0	PS	Rsvd	Page Code (19h)					
1	Page Length 06h)							
2	Reserved				Protocol Identifier (FCP = 0h)			
3	DTFD	PLPB	DDIS	DLM	RHA	ALWI	DTIPE	DTOLI
4	Reserved							
5	Reserved							
6	Reserved				RR_TOV Units			
7	Resource Recovery Time-Out Value (RR_TOV)							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	19h, indicating the Fibre Channel Logical Unit Control Mode Page.
Page Length	1		06h, indicating that six parameter bytes follow the Page Length byte.
Protocol Identifier	2	0-4	0 = Fibre Channel Protocol for SCSI (FCP)
DTOLI	3	0	Always 0, indicating that the drive can initiate LIP.
DTIPE	3	1	Always 0, indicating that the drive will insert itself in the loop waiting for LPE.
ALWI	3	2	Always 0, indicating that the drive will accept login without LIP.
RHA	3	3	Always 0, indicating that the drive will attempt to obtain an address during the LISA phase of LIP.
DLM	3	4	Always 0, indicating that the drive will not attempt to become loop master
DDIS	3	5	Always 0, indicating that address discovery is required following LIP
PLPB	3	6	Always 0, indicating that the drive will response to Loop Port By-pass (LPB) and Loop Port Enable (LPE) primitive sequences
DTFD	3	7	Always 0, indicating that the drive will always recognize a fabric loop port and will perform the public loop functions required by FC-FLA.
RR_TOV Units	6	0-3	000b = No timer is specified. Field is not changeable. The drive implements the FCP-2 default values.
RR_TOV	7		Resource Recovery Timeout Value (RR_TOV) in the units specified by the preceding field. Value is reported as 0 and is non-changeable.
Reserved			All reserved bits must be 0.

Information Exceptions Mode Page

The Information Exceptions Mode Page controls exception reporting via the TapeAlert log page.

Byte	Bits 7	6	5	4	3	2	1	0
0	Rsvd	Page Code (1Ch)						
1	Page Length (0Ah)							
2	Perf	Reserved			DEx-cept	Test	Rsvd	LogErr
3	Reserved				MRIE			
4	Interval Timer, MSB							
5	Interval Timer							
6	Interval Timer							
7	Interval Timer, LSB							
8	Test Flag Number, MSB							
9	Test Flag Number							
10	Test Flag Number							
11	Test Flag Number, LSB							

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	1Ch, indicating the Information Exceptions Mode Page.
Additional Page Length	1		Always 0Ah, indicating that 10 parameter bytes follow the Page Length byte.
Perf	2	7	Always 0, indicating that this feature is not supported.
DExcept	2	3	0 = Exception reporting is enabled. 1 = Exception reporting is disabled (default).
Test	2	2	0 = Normal operation (default). 1 = Fail next command (see below) with: 01/5D/FF if Test Flag Numbert is 0. 01/5D/00 if Test Flag Number indicates a valid value (see below). This is reported only one time between resets. Test bit and Test Flag Number are cleared right away after the Mode Select and are displayed as 0s in Mode Sense.
LogErr	2	0	Always 0, indicating that this feature is not supported.
MRIE	3	0-3	Always 3, so if an exception occurs, the next command (except Inquiry and Request Sense) will get check condition status and the Sense Key will be set to Recovered Error (01) and the Additional Sense will be set to Failure Prediction Threshold Exceeded (5D00).
Interval Timer	4-7		Always 0, indicating that this feature is not supported.
Test Flag Number	8-11		This field is in 2's complement. 0 = No flag number. If Test = 1, then Test bit will be cleared only in Mode Sense when 01/5D/FF is returned. If Test = 0 and Test Flag Number is not 0, return Check Condition. If Test = 1 and Test Flag Number is one of the following: 1 to 64 = Set the indicated tape alert flag in log page 2Eh if it is supported. Otherwise, return Check Condition. -1 to -64 = Clear the indicated tape alert flag (from 1 to 64) if it is supported. Otherwise, return Check Condition. 32767 = Set all supported tape alert flags.

Field	Bytes	Bits	Description
Rsvd			All reserved bits must be 0.

Drive Capabilities Control Mode Page

The Drive Capabilities Control mode page controls the capabilities of the Viper drive. A single copy of this page is maintained for all initiators. New Inquiry String Control, Firmware Test Control, and Data Compression Control will be in effect immediately after Mode Select. New Operating Systems Support, Extended POST Mode, and Auto Unload Mode will be in effect the next power cycle, after Mode Select. This page persists across power cycles.

Byte	Bits 7	6	5	4	3	2	1	0
0	Reserved		Page Code (21h)					
1	Page Length (07h)							
2	Operating Systems Support							
3	Firmware Test Control-2							
4	Extended POST Mode							
5	Inquiry String Control							
6	Firmware Test Control							
7	Data Compression Control							
8	Host Unload Over-ride	Auto Unload Mode						

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	21h, indicating the Drive Capabilities Control Mode Page.
Additional Page Length	1		07h, indicating that seven parameter bytes follow the Page Length byte.
Operating Systems Support	2		0 = Standard LTO (default AU1-SCSI and ISV)
Firmware Test Control-2	3		0 = disable Factory test mode code (default) 1 = enable Factory test code 1 2 = enable Factory test code 2
POST Mode	4		0 = Enable POST (default) 1 = Disable POST
Inquiry String Control	5		0 = Standard Seagate Viper Inquiry string (default) 1 = Factory test only Inquiry string 1 2 = Factory test only Inquiry string 2
Firmware Test Control	6		0 = disable Factory test mode code (default) 1 = enable Factory test code 1 2 = enable Factory test code 2
Data Compression Control	7		0 = Full Mode Page 0Fh & 10h Control of Compression (default) 1 = Auto compression with No SCSI Mode control 2 = Compression Disabled with No SCSI Mode control
Host Unload Override	8	7	The Host Unload Override when set will place the drive into a mode where SCSI Unload commands from the host will not eject the cartridge. Library systems that do not want the host to eject the cartridge should set this bit.

Field	Bytes	Bits	Description
Auto Unload Mode	8	0-6	The Auto Unload Mode allows the drive to control how the tape is unloaded when (a) a power cycle occurs with a tape inside, (b) an incompatible tape is inserted, (c) a firmware download occurs with a tape inside, and (d) the cleaning tape has finished the cleaning process. 0 = Data cartridge stays threaded at BOT; do not unthread and do not unload. (default) 1 = Unthread. 2 = Unthread and unload. 3 = Unthread and unload non data cartridges, data cartridges are threaded to BOT.
Reserved			All reserved bits must be 0.

Interface Control Mode Page

The Interface Control mode page controls the selection ID used by the primary interface (Parallel SCSI or Fibre Channel), as well as parameters of the Library serial interface. A single copy of this page is maintained for all initiators. New CmdFwd and Alerts will be in effect immediately after Mode Select. New Baud Rate, 2StopBits, Next Selection ID, Target Initiated Bus Control, and Disable Wide Bus Mode will be in effect the next reset or power cycle after Mode Select. This page persists across power cycles.

Alerts are not implemented, so this field has a value of 0 and is not changeable.

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Reserved			Page Code (22h)				
1	Page Length (0Eh)							
2	Baud Rate							
3	Reserved				CmdFwd		2Stop Bits	Alerts
4	Port A Transport Type							
5	Port A Present Selection ID, MSB							
6	Port A Present Selection ID							
7	Port A Present Selection ID, LSB							
8	Port B Transport Type							
9	Port B Present Selection ID, MSB							
10	Port B Present Selection ID							
11	Port B Present Selection ID, LSB							
12	Next Selection ID							
13	Jumpered Selection ID							
14	Target Initiated Bus Control							
15	Reserved							Disable-Wide Bus Mode

Field Descriptions

Field	Bytes	Bits	Description
Page Code	0	0-5	22h, indicating the Interface Control Mode Page.
Additional Page Length	1		Always 0Eh, indicating that fourteen parameter bytes follow the Page Length byte.
Baud Rate	2		The baud rate at which the Library interface will operate after the next reset. 0 = 9600 baud 1 = 4800 baud 2 = 9600 baud 3 = 19200 baud 4 = 38400 baud 5 = 57600 baud 6 = 112500 baud
Alerts	3	0	0 = Disable unsolicited alert messages to the tape library via the serial interface. 1 = Enable unsolicited alert messages to the tape library via the serial interface. This field is fixed at 0 and is not changeable, because Alerts are not implemented.
2StopBits	3	1	0 = Library interface transmits 1 stop bit per byte. 1 = Library interface transmits 2 stop bits per byte.
Cmd Fwd	3	2-3	0 = Command forwarding disabled. 1 = Command forwarding enabled. Note: Not all drives support command forwarding. If the value in this field is zero and it is not changeable, then command forwarding is not supported.
Port A Transport Type	4		0 = Port A link is down. 1 = Parallel SCSI Interface 2 = Port A link is up at 1 Gbaud (Fibre Channel interface only)
Port A Present Selection ID	5-7		Parallel SCSI Interface: The SCSI ID to which the drive responds. Fibre Channel Interface: The current 24-bit ID of Port A.
Port B Transport Type	8		Parallel SCSI Interface: Always 0 Fibre Channel Interface: 0 = Port B link is down. 2 = Port B link is up at 1 Gbaud.
Port B Present Selection ID	9-11		Parallel SCSI Interface: Always 0 Fibre Channel Interface: The current 24-bit ID of Port B.
Next Selection ID	12		Parallel SCSI Interface: The SCSI ID that the drive will respond to after the next reset. This is provided to obviate the need for changing address jumpers. Fibre Channel Interface: The Assigned Loop Identifier corresponding to the AL-PA that the drive will attempt to acquire during the LIHA phase of the next LIP. This is provided to obviate the need for changing address jumpers.

Field	Bytes	Bits	Description
Jumpered Selection ID	13		The Selection ID that is set by external jumpers.

Target Initiated Bus Control	14		Parallel SCSI Interface:
			    0 = no Target Initiated modes (default)
			    1 through FFh = Reserved
			Fibre Channel Interface: Reserved

Disable Wide Bus Mode	15	0	Parallel SCSI Interface:
			    0 = Enable Wide bus operations (default)
			    1 = Disable Wide bus operations – this will allow the Viper drive to be connected to narrow SCSI buses.
			Fibre Channel Interface: Reserved

Reserved			All reserved bits must be 0.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The defined mode is set and remains set until another MODE SELECT or RESET command is issued. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 01h Recovered Error One or more parameters was rounded to complete the command. 04h Hardware Error Parity error on the SCSI bus or drive hardware failure. 05h Illegal Request The Page Length field is incorrect, or the Command Descriptor Block is invalid. 06h Unit Attention The cartridge was changed, or the drive was reset prior to this command.

MODE SENSE

The MODE SENSE command allows the host to determine various drive parameters. These parameters are sent from the drive to the host as data formatted in a parameter list. This command is complementary to the Mode Select command that sets device parameters.

The drive terminates execution of the Mode Sense command:

- When the number of bytes specified in the Allocation Length field have been sent to the host, or
- When all available Mode Sense data has been sent to the host.

If a Mode Select command has not been performed since power-on or SCSI Reset, the default mode parameters are in effect.

All Mode Select parameters may be rounded up or down, as appropriate. A Mode Sense command may be issued after a Mode Select command to determine which parameters have been rounded.

Block and page descriptions for this command are shown on subsequent pages.

Command Descriptor Block

6-Byte Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (1Ah)							
1	Ignored LUN			Rsvd	DBD	Reserved		
2	PC		Page Code					
3	Reserved							
4	Allocation Length							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for the 6-byte version of Mode Sense is 1Ah.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
DBD	1	3	0 = Return the block descriptor in the Mode Sense data. 1 = Disable Block Descriptors (DBD). NOTE: When the DBD is 1, the Block Descriptor Length in the parameter header is 0.
PC	2	6-7	Page Control specifies the type of values to be returned. 00b = Report current values. 01b = Report changeable values. Any bit that can be changed by Mode Select is set to 1; otherwise, the bits are set to 0. 10b = Report default values. Returns the power-up, or reset, values. 11b = Report saved values. Returns the power-up, or reset, values.
Page Code	2	0-5	The Page Code selects the page or pages to be returned by the drive. 00h = Return only the Parameter List Header/Block Descriptor 02h = Return the Disconnect/Reconnect Page 0Ah = Return the Control Mode Page 0Fh = Return the Data Compression Control Page 10h = Return the Device Configuration Page 1Ch = Return the Information Exceptions Page 21h = Return the Drive Capabilities Page 22h = Return the Interface Control Page 3Fh = Return all available pages in ascending order starting from page 02h
Allocation Length	4		Specifies the number of bytes the host has allocated for returned Mode Sense data. The drive will not return more than this amount of data. A value of 0 is a valid entry and indicates no data.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

10-Byte Command Descriptor Block

	Bits							
Byte	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	Operation Code (5Ah)							
1	Ignored LUN			Rsvd	DBD	Reserved		
2	PC			Page Code				
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	Allocation Length, MSB							
8	Allocation Length, LSB							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for the 6-byte version of Mode Sense is 1Ah.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
DBD	1	3	0 = Return the block descriptor in the Mode Sense data. 1 = Disable Block Descriptors (DBD). NOTE: When the DBD is 1, the Block Descriptor Length in the parameter header is 0.
PC	2	6-7	Page Control specifies the type of values to be returned. 00b = Report current values. 01b = Report changeable values. Any bit that can be changed by Mode Select is set to 1; otherwise, the bits are set to 0. 10b = Report default values. Returns the power-up, or reset, values. 11b = Report saved values. Returns the power-up, or reset, values. 76b = Unit
Page Code	2	0-5	The Page Code selects the page or pages to be returned by the drive. 00h = Return only the Parameter List Header/Block Descriptor 02h = Return the Disconnect/Reconnect Page 0Ah = Return the Control Mode Page 0Fh = Return the Data Compression Control Page 10h = Return the Device Configuration Page 1Ch = Return the Information Exceptions Page 21h = Return the Drive Capabilities Page 22h = Return the Interface Control Page 3Fh = Return all available pages in ascending order starting from page 02h
Allocation Length	7-8		Specifies the number of bytes the host has allocated for returned Mode Sense data. The drive will not return more than this amount of data. A value of 0 is a valid entry and indicates no data.
Reserved			All reserved bits must be 0.
Control			See Control Byte Format on page 20.

Mode Sense Data

The Mode Sense data list, for both the 6-byte CDB and 10-byte CDB versions is in the following general format:

Mode Parameter Header	The Mode Parameter Header is always returned.
Block Descriptor	The Block Descriptor is returned if DBD is 0 in the Mode Sense CDB.
Mode Parameter Pages	One or all Mode Parameter Pages may be returned depending on the value of Page Code in the Mode Sense CDB.

Mode Parameter Header

6-Byte CDB Mode Parameter Header

	Bits							
Byte	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	Mode Data Length							
1	Medium Type							
2	WP	Buffered Mode			Speed			
3	Block Descriptor Length							

Field Descriptions

Field	Bytes	Bits	Description
Mode Data Length	0		Mode Select: Always 0. Mode Sense: The number of bytes of data available.
Medium Type	1		Identifies the type of media currently in the drive. 0 = Data Cartridge 1 = Cleaning Cartridge
WP	2	7	Mode Select: Ignored. Mode Sense: 0 = The cartridge is not write protected. 1 = the cartridge is write protected.
Buffered Mode	2	4-6	0 = Unbuffered mode. 1 = Buffered mode (default).
Speed	2	0-3	This field indicates the tape speed. 0 = Default 3 = 2.077 m/sec (meter/second) 4 = 2.576 m/sec 5 = 3.097 m/sec 6 = 3.643 m/sec 7 = 4.153 m/sec
Block Descriptor Length	3		0 = No Block Descriptor follows. 8 = 8-byte Block Descriptor follows.
Reserved			All reserved bits must be 0.

When Buffered Mode is 1, a Write command is terminated when the data is transferred to the internal buffer of the drive. When Buffered Mode is 0 a Write command is not terminated until all data has been transferred to tape.

10-Byte CDB Mode Parameter Header

Byte	Bits 7	6	5	4	3	2	1	0
0	Mode Data Length, MSB							
1	Mode Data Length, LSB							
2	Medium Type							
3	WP	Buffered Mode			Speed			
4	Reserved							
5	Reserved							
6	Block Descriptor Length, MSB							
7	Block Descriptor Length, LSB							

Field Descriptions

Field	Bytes	Bits	Description
Mode Data Length	0-1		Mode Select: Always 0.
			Mode Sense: The number of bytes of data available.
Medium Type	1		Identifies the type of media currently in the drive.
			0 = Data Cartridge
			1 = Cleaning Cartridge
WP	3	7	Mode Select: Ignored.
			Mode Sense: 0 = The cartridge is not write protected.
			1 = the cartridge is write protected.
Buffered Mode	3	4-6	0 = Unbuffered mode.
			1 = Buffered mode (default).
Speed	3	0-3	This field indicates the tape speed.
			0 = Default
			3 = 2.077 m/sec (meter/second)
			4 = 2.576 m/sec
			5 = 3.097 m/sec
			6 = 3.643 m/sec
			7 = 4.153 m/sec
Block Descriptor Length	6-7		0 = No Block Descriptor follows.
			8 = 8-byte Block Descriptor follows.
Reserved			All reserved bits must be 0.

When Buffered Mode is 1, a Write command is terminated when the data is transferred to the internal buffer of the drive. When Buffered Mode is 0 a Write command is not terminated until all data has been transferred to tape.

Block Descriptor

Byte	Bits 7	6	5	4	3	2	1	0
0	Density Code							
1	Reserved							
2	Reserved							
3	Reserved							
4	Reserved							
5	Block Length, MSB							
6	Block Length							
7	Block Length, LSB							

Field Descriptions

Field	Bytes	Bits	Description

Density Code	0		Identifies the format of the tape currently in the drive.
			Mode Select: 00h = Default of Ultrium 1
			                40h = Ultrium 1
			                7Fh = No-op
			Mode Sense: 00h = Default of Ultrium 1

Block Length	5-7		0 = Variable length block mode. The Fixed bit in Read and Write commands must be 0. 1 to FFFFFFh = The length of the fixed-length block to be read or written when the Fixed bit is set in a Read or Write command.
Reserved			All reserved bits must be 0.

Mode Parameter Pages

There are several mode parameter pages that allow you to retrieve different drive parameters. The format of these pages is described in the Mode Select command, starting on page 44. The following mode parameter pages are supported:

Mode Parameter Page	See Page
Disconnect/Reconnect Page	58
Control Mode Page	59
Data Compression Control Page	60
Sequential Access Device Configuration Page	61
Information Exceptions Mode Page	62
Drive Capabilities Control Mode Page	65
Interface Control Mode Page	66

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. MODE SENSE does not set or change any modes. • The tape position is not changed. It remains at the previous position.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 04h Hardware Error Parity error on the SCSI bus or drive hardware failure. 05h Illegal Request The Command Descriptor Block is invalid. 06h Unit Attention The cartridge was changed, or the drive was reset prior to this command.

PARK UNPARK

The Park Unpark command with the park bit set requests that the drive park the load arm in preparation for transport.

The Park Unpark command with the park bit not set requests that the drive load arm be unparked. This is not usually necessary as the drive automatically unparks on power up.

In either case, attempting to issue this command while the medium is present will result in a vendor specific check condition of MEDIUM_IS_PRESENT (09/80/80).

The Park Unpark command is a vendor unique command.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (06h)							
1	Ignored LUN			Reserved				
2	Reserved							
3	Reserved							
4	Reserved							Park
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Park Unpark is 06h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Park	4	0	0b = Requests the drive to be unparked. 1b = Requests the drive to be parked.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:

		Code	Message	Description
		04h	Hardware Error	Drive hardware failure.
		05h	Illegal Request	The Command Descriptor Block is invalid.
		06h	Unit Attention	The cartridge was changed, or the drive was reset prior to this command.
		09h	Medium Present	Cannot park drive with medium present.

PERSISTENT RESERVE IN (Fibre Channel drive only)

The Persistent Reserve In command is used to obtain information about persistent reservations and reservation keys that are active within a device server. This command is used in conjunction with the Persistent Reserve Out command.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (5Eh)							
1	Reserved			Service Action				
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	Allocation Length, MSB							
8	Allocation Length, LSB							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Persistent Reserve In is 5Eh.
Service Action	1	0-4	00h = READ KEYS Reads all registered Reservation Keys 01h = READ RESERVATION Reads the current persistent reservations
Allocation Length	7-8		How much space has been allocated for the returned parameter list.
Reserved			All reserved bits must be 0.
Control	9		See Control Byte Format on page 20.

PERSISTENT RESERVE IN parameter data for READ KEYS

Byte	Bits 7	6	5	4	3	2	1	0
0	Generation, MSB							
3	Generation, LSB							
4	Additional Length, MSB							
7	Additional Length, LSB							
	Reservation Key List							
8	First Reservation Key, MSB							
15	First Reservation Key, LSB							

Byte	Bits 7	6	5	4	3	2	1	0
				.				
				.				
				.				
n-7	Last Reservation Key, MSB							
n	LastReservation Key, LSB							

PERSISTENT RESERVE IN parameter data for READ RESERVATION

Byte	Bits 7	6	5	4	3	2	1	0
0	Generation, MSB							
3	Generation, LSB							
4	Additional Length, MSB							
7	Additional Length, LSB							
8	Reservation Descriptors, MSB							
n	Reservation Descriptors, LSB							

PERSISTENT RESERVE IN reservation descriptor

Byte	Bits 7	6	5	4	3	2	1	0
0	Reservation Key, MSB							
7	Reservation Key, LSB							
8	Scope-Specific Address, MSB							
11	Scope-Specific Address, LSB							
12	Reserved							
13	Scope				Type			
14	Obsolete							
15	Obsolete							

Field	Bytes	Bits	Description
Scope	2 (13?)	4-7	0h = LU_SCOPE: Persistent reservation applies to the full logical unit
Type	2 (13?)	0-3	1h = Write Exclusive Reads Shared: Any application client on any initiator may initiate tasks that request transfers from the storage medium or cache of the logical unit to the initiator. Writes Exclusive: Any task from any initiator other than the initiator holding the persistent reservation that requests a transfer from the initiator to the storage medium or cache of the logical unit shall be terminated with RESERVATION CONFLICT status. 3h = Exclusive Access Reads Exclusive: Any task from any initiator other than the initiator holding the persistent reservation that requests a transfer from the storage medium or cache of the logical unit to the initiator shall be terminated with RESERVATION CONFLICT status. Writes Exclusive: Any task from any initiator other than the initiator holding the persistent reservation that requests a transfer from the initiator to the storage medium or cache of the logical unit shall be terminated with RESERVATION CONFLICT status. 5h = Write Exclusive – Registrants Only Reads Shared: Any application client on any initiator may initiate tasks that request transfers from the storage

Field	Bytes	Bits	Description
			medium or cache of the logical unit to the initiator. Writes Exclusive: A task that requests a transfer to the storage medium or cache of the logical unit from an initiator that is not currently registered with the device server shall be terminated with RESERVATION CONFLICT status. 6h = Exclusive Access – Registrants Only Reads Exclusive: A task that requests a transfer from the storage medium or cache of the logical unit to an initiator that is not currently registered with the device server shall be terminated with RESERVATION CONFLICT status. Writes Exclusive: A task that requests a transfer to the storage medium or cache of the logical unit from an initiator that is not currently registered with the device server shall be terminated with RESERVATION CONFLICT status.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 05h Illegal Request The Command Descriptor Block is invalid.

PERSISTENT RESERVE OUT (Fibre Channel drive only)

The PERSISTENT RESERVE OUT command (see table 78) is used to request service actions that reserve a logical unit or element for the exclusive or shared use of a particular initiator. The command uses other service actions to manage and remove such reservations. The command shall be used in conjunction with the PERSISTENT RESERVE IN command and shall not be used with the RESERVE and RELEASE commands. Initiators performing PERSISTENT RESERVE OUT service actions are identified by a reservation key provided by the application client. An application client may use the PERSISTENT RESERVE IN command to obtain the reservation key for the initiator holding a persistent reservation and may use the PERSISTENT RESERVE OUT command to preempt that reservation.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (5Fh)							
1	Reserved			Service Action				
2	Scope				Type			
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	Parameter Length, MSB (00h)							
8	Parameter Length, LSB (18h)							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Persistent Reserve Out is 5Fh.
Service Action	1	0-4	See following table.
Scope	2	4-7	0h = LU_SCOPE: Persistent reservation applies to the full logical unit
Type	2	0-3	See Type field for the PERSISTENT RESERVE IN reservation descriptor.
Reserved			All reserved bits must be 0.
Control	9		See Control Byte Format on page 20.

PERSISTENT RESERVE OUT service action codes

Code	Name	Description	GENERATION field incremented
00h	REGISTER	Register a reservation key with the device server.	Yes
01h	RESERVE	Creates a persistent reservation having a specified SCOPE and TYPE.	No
02h	RELEASE	Releases the selected reservation for the requesting initiator.	No
03h	CLEAR	Clears all reservation keys and all persistent reservations.	Yes
04	PREEMPT	Preempts persistent reservations from another initiator.	Yes
05h	PREEMPT AND ABORT	Preempts persistent reservations from another initiator and aborts all tasks for all initiators registered with the specified reservation key.	Yes
06h	REGISTER AND IGNORE EXISTING KEY	Register a reservation key with the device server or unregister a reservation key.	Yes

PERSISTENT RESERVE OUT parameter list

Byte	Bits 7	6	5	4	3	2	1	0
0	Reservation Key, MSB							
7	Reservation Key, LSB							
8	Service Action Reservation Key, MSB							
15	Service Action Reservation Key, LSB							
16	Scope-Specific Address, MSB							
19	Scope-Specific Address, LSB							
20	Reserved							ATPTL
21	Reserved							
22	Obsolete							
23	Obsolete							

Field	Bytes	Bits	Description
APTPL	20	0	If the last valid APTPL bit value received by the device server is zero, the loss of power in the target shall release the persistent reservation for all logical units and remove all reservation keys. If the last valid APTPL bit value received by the device server is one, the logical unit shall retain any persistent reservation(s) that may be present and all reservation keys for all initiators even if power is lost and later returned.
Obsolete			All obsolete fields must be 0.

PERSISTENT RESERVE OUT service actions and valid parameters

Service Action	Allowed SCOPE	Parameters			
		TYPE	RESERVATION KEY	SERVICE ACTION RESERVATION KEY	SCOPE-SPECIFIC ADDRESS
REGISTER	ignored	ignored	valid	valid	ignored

Service Action	Allowed SCOPE	Parameters			
		TYPE	RESERVATION KEY	SERVICE ACTION RESERVATION KEY	SCOPE-SPECIFIC ADDRESS
REGISTER AND IGNORE EXISTING KEY	ignored	ignored	ignored	valid	ignored
RESERVE	LU_SCOPE	valid	valid	ignored	ignored
RELEASE	LU_SCOPE	valid	valid	ignored	ignored
CLEAR	ignored	ignored	valid	valid	ignored
PREEMPT	LU_SCOPE	valid	valid	valid	ignored
PREEMPT & ABORT	LU_SCOPE	valid	valid	valid	ignored

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 05h Illegal Request The Command Descriptor Block is invalid.

PREVENT ALLOW MEDIA REMOVAL

The Prevent Allow Medium Removal command requests that the target enable or disable the removal of the medium from the drive. The drive will not allow medium removal if any initiator currently has medium removal prevented.

If medium removal is prevented and the medium is in the loaded position, then:

- Pressing the eject button on the front panel will be ignored.

- The Load Unload command with the LOAD bit set to zero will result in a Check Condition status. The sense code is set to Illegal Request and the Additional Sense to Medium Removal Prevented (5302).

All initiators that have prevented medium removal must enable it before the medium can be removed from the drive.

A bus reset, BDR message or power cycle will clear any previous medium removal prevented setting and allow medium removal.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (1Eh)							
1	Ignored LUN			Reserved				
2	Reserved							
3	Reserved							
4	Reserved						Prevent	
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Prevent/Allow Medium Removal is 1Eh.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Prevent	4	0-1	00b = Medium removal allowed. 01b = Medium removal prevented. 10b = Not supported, no medium changer. 11b = Not supported, no medium changer.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 04h Hardware Error Parity error on the SCSI bus or drive hardware failure. 05h Illegal Request The Command Descriptor Block is invalid. 06h Unit Attention The cartridge was changed, or the drive was reset prior to this command.

READ

The READ command transfers one or more bytes or blocks from the drive to the Initiator beginning with the next block on tape.

If the Fixed flag is clear and Transfer Length is not zero, then a single block of the length in Transfer Length is transferred. If the next block on tape is of this length or shorter then it is transferred to the initiator. If the next block is longer than this length, then only the length requested is returned and the logical position is set to after the record. If the length of the block was the same as the Transfer Length field, then good status is returned. If the length of the block was not the same as in Transfer Length and the Suppress Illegal Length Indicator (SILI) flag was clear, then Check Condition Status is returned. If the length of the block was not the same as in Transfer Length and the Suppress Illegal Length Indicator (SILI) flag was set, then Good status is returned.

If the fixed flag is set and the Transfer Length field is not zero and the Suppress Illegal Length Indicator (SILI) flag is clear, then a sequence of blocks of the currently configured block length is to be returned, the number of blocks being indicated in the Transfer Length field. If there is a sequence of blocks of this length on the tape, they are returned to the initiator with good status. If a block that is longer than the configured length is encountered before the sequence is complete, the blocks up to that block are returned followed by the configured length from the record that was too long and Check Condition status. If a block that is shorter than the configured length is encountered before the sequence is complete, the blocks up to that block are returned followed by all of that block and Check Condition status. The current position is set after the last block that was returned or partially returned.

If the Transfer Length field is zero and the Suppress Illegal Length Indicator and the Fixed bit are not both set, then no action is taken.

If Suppress Illegal Length Indicator (SILI) flag is set and the Fixed bit is set, then Check Condition status is returned. The sense key is set to Illegal Request and the Additional Sense to Invalid Field in CDB (2400).

Command Descriptor Block

The following table shows the layout of the CDB.

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (08h)							
1	Ignored LUN			Reserved			SILI	Fixed
2	Transfer Length, MSB							
3	Transfer Length							
4	Transfer Length, LSB							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Read is 08h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
SILI	1	1	0 = Return Check Status when an incorrect block length is detected. 1 = Suppresses incorrect length error reporting when reading variable-length blocks
Fixed	1	0	0 = Variable block length. Transfer Length contains the number of bytes to return. 1 = Fixed block length, as specified by the Mode Select Block Descriptor. Transfer Length contains the number of blocks to return
Transfer Length	2-4		This field specifies the number of bytes (Fixed = 0) or blocks (Fixed = 1) to be read. A transfer length of 0 is valid and no data is transferred.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

If the SILI bit is 1 and the Fixed bit is 1, the drive returns a Check Condition with Illegal Request sense key with an additional sense code of Invalid Field in CDB.

When the SILI bit is 1 and Fixed bit is 0 and the only error encountered by the drive is that the actual block length differs from the requested transfer length, then the drive:

- Returns a Check Condition if the actual block length is larger than the requested transfer length and the Block Length field in the Mode Parameter block descriptor is nonzero.

- Does not return a Check Condition if the actual block length is smaller than the requested transfer length or if the actual block is larger than the requested block and the block length in the Mode Parameter block descriptor is 0.

If the Fixed flag is clear and Transfer Length is not zero, then a single block of the length in Transfer Length is transferred. If the next block on tape is of this length or shorter then it is transferred to the initiator. If the next block is longer than this length, then only the length requested is returned and the logical position is set to after the record. If the length of the block was the same as the Transfer Length field, then good status is returned. If the length of the block was not the same as in Transfer Length and the Suppress Illegal Length Indicator (SILI) flag was clear, then Check Condition Status is returned. If the length of the block was not the same as in Transfer Length and the Suppress Illegal Length Indicator (SILI) flag was set, then Good status is returned.

If the fixed flag is set and the Transfer Length field is not zero and the Suppress Illegal Length Indicator (SILI) flag is clear, then a sequence of blocks of the currently configured block length is returned, the number of blocks being indicated in the Transfer Length field. If there is a sequence of blocks of this length on the tape, they are returned to the initiator with good status. If a block that is longer than the configured length is encountered before the sequence is complete, the blocks up to that block are returned followed by the configured length from the record that was too long and Check Condition status. If a block that is shorter than the configured length is encountered before the sequence is complete, the blocks up to that block are

returned followed by all of that block and Check Condition status. The current position is set after the last block that was returned or partially returned.

If the Transfer Length field is zero and the Suppress Illegal Length Indicator and the Fixed bit are not both set, then no action is taken.

If Suppress Illegal Length Indicator (SILI) flag is set and the Fixed bit is set, then Check Condition status is returned. The sense key is set to Illegal Request and the Additional Sense to Invalid Field in CDB (2400).

Read Command Operation

The Read command is complete when one of the following conditions is met. These conditions are described in the following paragraphs.

- End-of-Data (EOD) is reached.
- A filemark (FM) is read.
- Transfer length is satisfied
- End-of-Tape (EOT) or end-of-partition (EOP) is reached.
- Unrecoverable data error occurs.
- Detection of incorrect block length.

End-of-Data

If EOD is encountered, the command terminates with a Check Condition status and a Sense Key of 08h. If the Valid bit (byte 0, bit 7) is set indicating a residual count, the Residual length field is determined as follows:

- If the Fixed bit is 1, it equals the difference between the CDB transfer length and the number of actual blocks read.
- If the Fixed bit is 0, it equals the CDB transfer length.

The tape is then positioned to allow an Append Data operation.

Filemark

If a filemark is encountered, the command terminates with a Check Condition, and the filemark bit (byte 2, bit 7) of the sense data is set to 1. If the Valid bit (byte 0, bit 7) is set indicating a residual count, the Residual length field is determined as follows:

- If the Fixed bit is 1, it equals the difference between the CDB transfer length and the number of actual blocks read.
- If the Fixed bit is 0, it equals the CDB transfer length.

On termination, the tape is positioned after the filemark on the EOT side of tape.

Transfer Length Satisfied

If the CDB Transfer Length is satisfied, the command completes successfully with a Good Status, and the tape is positioned on the EOT side of the last block read.

End of Tape (EOT) or End-of-Partition (EOP)

When the end-of-tape or end-of-partition position is encountered, the command terminates with a Check Condition and Medium Error (03h) sense key. The Valid bit (byte 0, bit 7) and the EOM bit (byte 2, bit 6) are set.

The Residual Length field is then set as follows:

- If the Fixed bit is 1, it equals the difference between the CDB transfer length and the number of actual blocks read.
- If the Fixed bit is 0, it equals the CDB transfer length.

The logical position after encountering an end-of-tape or end-of-partition error is undetermined.

Recoverable Data Error

If an error is encountered while reading the drive applies its retry algorithm. If the algorithm process cannot recover the error is reported as an unrecoverable read error.

Unrecoverable Data Error

If an Unrecoverable Data Error is encountered, the READ command terminates with Check Condition and a Medium Error (03h) sense key.

If the Valid bit (byte 0, bit 7) is set, Residual Length field equals the difference between the requested Transfer Length and the actual number of blocks or bytes transferred. On termination, the tape is positioned after the error block on the EOT side of tape.

Incorrect Length

Writing fixed- and variable-length blocks varies according to the setting of the Fixed bit.

When the Fixed bit is set (1), one or more tape blocks can be read. The CDB Transfer Length field specifies the block count to read. The block size is the current block size of the drive, which is set to 512 at power-up or after a SCSI Bus Reset.

The host can change the current block size by issuing a MODE SELECT command with a new block descriptor parameter that specifies a new block size. If the current block size differs from the actual block size of the block being read, the drive reports an Incorrect Length error.

When the Fixed bit is reset (0), the CDB Transfer Length field indicates the number of bytes to be read. When the actual block size found on tape differs from the CDB Transfer Length, an Incorrect Length error is reported.

The drive reports the Incorrect Length error based on the Suppress Incorrect Length Indicator (SILI) bit as follows:

- If the actual block length exceeds the CDB Transfer Length, the Incorrect Length error is reported.

- If the actual block length is smaller than the CDB Transfer Length and the SILI bit is 1, the drive ignores (that is, suppresses) the Incorrect Length error.

- If the actual block length is different than the CDB Transfer Length and the SILI bit is 0, the drive reports the Incorrect Length error.

The drive reports the Incorrect Length error by returning a Check Condition. The Incorrect Length Indicator bit (byte 2, bit 5) of the Request Sense data is set (1) indicating the Incorrect Length error. The Valid bit (byte 0, bit 7) of the Request Sense data is also set (1) indicating that the residual data (bytes 3 through 6) is valid. The meaning of the residual data depends on the setting of the Fixed bit.

For reading both fixed- and variable-length blocks, the logical position after encountering an Incorrect Length error in block N is always at the end of block N. The following figure illustrates this position.

Current Block Size = 512 bytes/block

Block N-1	Block N	Block N N+1
512 bytes	514 bytes	512 bytes

↑	↑
Encounter ILI **error reading** **block N**	**Logical Position** **after ILI error**

Fixed Mode Residual Data

When the Fixed bit is set (1), the residual data is set to the CDB Transfer Length *minus* the actual number of blocks *correctly* read without encountering an ILI error.

For example, assume the following:

- The current block size is 512 bytes/block.

- The drive is currently positioned before block N.

- Block N contains 514 bytes.

If the host issues a READ command with a CDB Transfer Length of one, indicating one 512-byte block is to be read, the drive transfers the first 512 bytes of block N; then skips the last two bytes (513 and 514) and reports a Check Condition (caused by an Incorrect Length error). The residual is set to one. This residual is determined as follows:

CDB Transfer Length = Number of blocks correctly read without encountering an ILI error (1 - 0 = 1).

The logical position after the error is after byte 514 of block N.

Variable Mode Residual Data

When the Fixed bit is reset (0), the residual data is always set to the CDB Transfer Length.

For example, assume the following:

- The drive is currently positioned before block N.

- Block N + 1 contains 512 bytes.

The host issues a READ command with a CDB Transfer Length of 514, indicating 514 bytes of data to be read. The drive transfers the first 512 bytes of block N; then stops because of an Incorrect Length error. The logical position after the error is after byte 512 of block N.

If the SILI bit is set (1), the drive does not report a Check Condition (caused by Incorrect Length error).

If the SILI bit is reset (0), the drive reports a Check Condition, and the residual is set to 2 (CDB Transfer Length = 514).

In the above example, if the block size of block N is 514 bytes and a READ command specifies a Transfer Length of 512 bytes, the drive transfers the first 512 bytes of block N; then skips the last two bytes to position itself at the end of byte 514 of block N. The residual is set to -2. Because the actual block length exceeds the CDB Transfer Length, the drive unconditionally reports Check Condition. In this case, the residual is set to -2.

Completion Status

Code	Message	Description		
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape is positioned on the EOT side of the last block read.		
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:		
		Code	**Message**	**Description**
		02h	Not Ready	No cartridge is in the drive.
		03h	Media Error	Unrecoverable data error encountered.
		04h	Hardware Error	Parity error on the SCSI bus or drive hardware failure.
		05h	Illegal Request	The Command Descriptor Block is invalid.
		06h	Unit Attention	The cartridge was changed, or the drive was re-set prior to this command.
		08h	Blank Check	The drive encountered EOD.

READ BLOCK LIMITS

The Read Block Limits command requests that the drive return the maximum and minimum block sizes that it supports. The minimum block length is always reported as 1 byte, the maximum as 2^{24}-1 bytes.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (05h)							
1	Ignored LUN			Reserved				
2	Reserved							
3	Reserved							
4	Reserved							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Read Block Limits is 05h
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

The host specifies the actual block size in fixed mode with the Mode Select command and in variable mode with the transfer/allocation length of Read and Write commands. The use of the Mode Sense command determines the current block size. The Read Block Limits command indicates the minimum and maximum block size that the drive can support.

Block Limit Data

The Read Block Limits command returns data in the following format.

Byte	Bits 7	6	5	4	3	2	1	0
0	Reserved							
1	Maximum Block Length, MSB							
2	Maximum Block Length							
3	Maximum Block Length, LSB							
4	Minimum Block Length, MSB							
5	Minimum Block Length, LSB							

Field Descriptions

Field	Bytes	Bits	Description
Reserved			All reserved bits must be 0.
Maximum Block Length	1-3		Always FFFFFFh, indicating a maximum block length of 2^{24}-1 bytes.
Minimum Block Length	4-5		Always 0001h, indicating a minimum block length of 1.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 04h Hardware Error Parity error on the SCSI bus or drive hardware failure. 05h Illegal Request The Command Descriptor Block is invalid. 06h Unit Attention The cartridge was changed, or the drive was reset prior to this command.

READ BUFFER

The Read Buffer command reads data from the memory on the drive and sends it to the initiator. This command is used in conjunction with the Write Buffer command as a diagnostic function for testing the drive buffer memory and confirming the SCSI bus integrity. The tape is not accessed during execution of this command.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (3Ch)							
1	Ignored LUN			Rsvd	Mode			
2	Buffer ID							
3	Buffer Offset (MSB)							
4	Buffer Offset							
5	Buffer Offset (LSB)							
6	Allocation Length (MSB)							
7	Allocation Length							
8	Allocation Length (LSB)							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The operation code for Read Buffer is 3Ch.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Mode	1	0-3	0000b = Return descriptor and data. 0001b = Return Medium Auxiliary Memory(MAM) or EEPROM data. 0010b = Return data only. 0011b = Return descriptor only. 0100b = Return Trace Buffer data.
Buffer ID	2		00h = normal access (default) 54h = specifies access to MAM
Buffer Offset	3-5		For Mode not equal 0001b: The offset from the beginning of the specified buffer in bytes. For Mode equal 0001b: Set to the MAM page code as described in the tables or FFFFFFh to specify the entire 4KB MAM.
Allocation length	6-8		Specifies the amount of data bytes to be returned. A value of 0 is a valid entry and returns no data. The drive stops sending data when the number of bytes specified has been transferred or when all available data has been sent.
Reserved			All reserved bits must be 0.
Control	9		See Control Byte Format on page 20.

A Mode of 0000b requests that the data returned consist of a 4-byte descriptor header followed by the data from the buffer. The 4-byte header is included in the number of bytes specified by the Allocation Length. The Buffer ID and Buffer Offset fields are reserved.

A Mode of 0001b requests that data from the Medium Auxiliary Memory is returned.

A Mode of 0010b requests that only the data from the buffer is returned.

A Mode of 0011b requests that only the 4-byte descriptor header is returned. A Buffer ID value for which there is no buffer associated will result in an all zero header. The Buffer Offset field is reserved.

The Buffer ID field indicates which buffer is to be read. All drives support buffer 0. Other buffers may be available in the drive.

The Buffer Offset field may be used to specify the offset within the specified buffer from which the data will be transferred.

The Allocation Length is used to specify the number of bytes that the initiator has allocated for the returned data.

Read Buffer Descriptor

If the Mode field is set to 0000b or 0011b, then the data returned includes a 4 byte Read Buffer Descriptor. The following table shows the fields in the Read Buffer Descriptor.

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Reserved (0)							
1	Buffer capacity, MSB							
2	Buffer capacity							
3	Buffer capacity, LSB							

Field Descriptions

Field	Bytes	Bits	Description
Reserved	0		All bits are 0.
Buffer Capacity	1-3		The capacity of the drive's data buffer.

MAM Page Definitions

The following sections details the pages available in the MAM. Always refer to Ultrium Generation 1 8-Channel Format Specification Document for the latest up-to-date MAM data.

MAM Pages

The table below shows the Page ID used to identify each page within the MAM. Note that a Page ID of 0xFFFFFF is used when reading the entire MAM.

An optional page will not exist unless the drive has preformed an operation that requires information be stored to that optional page. A Read Buffer command to an optional page that has not been created will result in a check condition LUN NOT READY AUXILIARY MEMORY NOT ACCESSIBLE.

Page ID	Access	Description
FFFFFFh	RO	All pages.
000001h	RO	Cartridge Manufacturer's Information

Page ID	Access	Description
000002h	RO	Media Manufacturer's Information (optional)
0000F0h-0000FFh	RO	Drive Manufacturer Support (cleaning tape only)
0000FFh	RO	Universal Drive Support (Universal Cleaning Cartridge only)
000101h	RO	Initialization Data
000102h	RO	Tape Write Pass
000103h	RO	Tape Directory
000104h	RO	EOD Information
000105h	RO	Cartridge Status and Tape Alert Flags
000106h	RO	Mechanism Related (optional)
000107h	RO	Suspended Append Writes
000108h-00010Bh	RO	Usage Information (optional)
0001FCh-0001FFh	RO	Cleaning Usage Information (optional, cleaning tape only)
000200h	RW	Application Specific (optional)

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 04h Hardware Error Drive hardware failure detected. 05h Illegal Request The Command Descriptor Block is invalid. 06h Unit Attention The cartridge was changed or the drive was re-set prior to this command.

READ POSITION

The Read Position command reports the block address of the current data block. The current data block is the first data block that would be read from the current tape partition if a Read command were issued.

Command Descriptor Block

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Operation Code (34h)							
1	Ignored LUN			Reserved		TCLP	Long	Rsvd
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							
8	Reserved							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Read Position is 34h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
TCLP	1	2	1 = The drive returns data specifying the partition, file and set number with the current logical position. 0 = The drive returns data specifying the first and last block location. The Long bit and the TCLP bit must be equal, otherwise, the command shall be terminated with Check Condition status. The sense key shall be set to Illegal Request, and the additional sense code and an additional sense code qualifier set to Invalid Field in CDB.
Long	1	1	1 = The drive shall return 32 bytes of data. 0 = The drive shall return 20 bytes of data. The Long bit and the TCLP bit must be equal, otherwise, the command shall be terminated with Check Condition status. The sense key shall be set to Illegal Request, and the additional sense code and an additional sense code qualifier set to Invalid Field in CDB.
Reserved	2-8		All reserved bits must be 0.
Control	9		See Control Byte Format on page 20.

Read Position Data

The Read Position command returns a block of Read Position Data.

The following table shows the fields in the Read Position Data when the Long and TCLP bits are set to 0.

Byte	Bits 7	6	5	4	3	2	1	0
0	BOP	EOP	Reserved			BPU	Reserved	
1	Partition Number (0)							
2	Reserved							
3	Reserved							
4	First Block Location, MSB							
5	First Block Location							
6	First Block Location							
7	First Block Location, LSB							
8	Last Block Location, MSB							
9	Last Block Location							
10	Last Block Location							
11	Last Block Location, LSB							
12	Reserved							
13	Number of blocks in buffer, MSB							
14	Number of blocks in buffer							
15	Number of blocks in buffer, LSB							
16	Number of bytes in buffer, MSB							
17	Number of bytes in buffer							
18	Number of bytes in buffer							
19	Number of bytes in buffer, LSB							

Field Descriptions

Field	Bytes	Bits	Description
BOP	0	7	0 = The current logical position is not at BOT.
			1 = The current logical position is at Beginning-of-Partition (BOT).
EOP	0	6	0 = The current logical position is not between early-warning and end-of-tape.
			1 = The current logical position is between early-warning and end-of-tape.
BPU	0	2	0 = First Block Location and Last Block Location fields are valid.
			1 = First Block Location and Last Block Location fields are invalid.
Partition Number	1		This field is always 0.
First Block Location	4-7		The block address of the current logical position.
Last Block Location	8-11		The block address of the current logical position. Always the same as First Block Location.
Number of blocks in buffer	13-15		This field is not supported and is always 0.
Number of bytes in buffer	16-19		This field is not supported and is always 0.
Reserved			All bits are 0.

The First Block Location and the Last Block Location are both set to the number of blocks and file marks between BOT and current logical position. If the tape is at BOT, 0 is returned in these fields. The Beginning of Partition (BOP) flag is set if the Block Location fields are zero.

The following table shows the fields in the Read Position Data when Long and TCLP bits are set to 1.

Byte	Bits							
	7	6	5	4	3	2	1	0
0	BOP	EOP	Reserved		MPU	BPU	Reserved	
1	Reserved							
2	Reserved							
3	Reserved							
4	Partition Number, MSB (0)							
5	Partition Number (0)							
6	Partition Number (0)							
7	Partition Number, LSB (0)							
8	Block Number, MSB							
9	Block Number							
10	Block Number							
11	Block Number							
12	Block Number							
13	Block Number							
14	Block Number							
15	Block Number, LSB							
16	File Number, MSB							
17	File Number							
18	File Number							
19	File Number							
20	File Number							
21	File Number							
22	File Number							
23	File Number, LSB							
24	Set Number, MSB (0)							
25	Set Number (0)							
26	Set Number (0)							
27	Set Number (0)							
28	Set Number (0)							
29	Set Number (0)							
30	Set Number (0)							
31	Set Number, LSB (0)							

Field Descriptions

Field	Bytes	Bits	Description
BOP	0	7	0 = The current logical position is not at BOT.
			1 = The current logical position is at Beginning-of-Partition (BOT).
EOP	0	6	0 = The current logical position is not between early-warning and end-of-tape.
			1 = The current logical position is between early-warning and end-of-tape.
MPU	0	3	0 = File Number field is valid.
			1 = File Number field is invalid.
BPU	0	2	0 = Block Number field is valid.
			1 = Block Number field is invalid.
Partition Number	4-7		This field is always 0.

Field	Bytes	Bits	Description
Block Num-ber	8-15		This field indicates the number of logical blocks including filemarks between beginning-of-medium and the current logical position.
File Number	16-23		This field indicates the number of filemarks between beginning-of-medium and the current logical position.
Set Number	24-31		This field is always 0.
Reserved			All bits are 0.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape is not moved.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 02h Not Ready No cartridge is in the drive. 04h Hardware Error Drive hardware failure detected. 05h Illegal Request The CDB contains an invalid bit. 06h Unit Attention The cartridge was changed, or the drive was re-set prior to this command.

RECEIVE DIAGNOSTIC RESULTS

The Receive Diagnostic Results command requests that the results of a previously executed Send Diagnostics command be sent to the initiator.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (1C)							
1	Ignored LUN			Reserved				PCV
2	Page Code							
3	Allocation Length (MSB)							
4	Allocation Length (LSB)							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Receive Diagnostic Results is 1Ch.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Reserved	1	1-4	All reserved bits must be 0.
PCV	1	0	Page Code Valid bit. Not supported, should be set to 0.
Page Code	2		Valid only when PCV bit is set.
Allocation length	3-4		Specifies the amount of data to be returned. An ALLOCATION LENGTH of 0 is valid and shall not be considered an error.
Control	5		See Control Byte Format on page 20.

Returned Data

The Receive Diagnostic Results command returns a diagnostic page that reports the results of the previous Send Diagnostics command.

Returned Data Format

Byte	Bits 7	6	5	4	3	2	1	0
0	Page Code							
1	Reserved							
2	Page Length (MSB)							
3	Page Length (LSB)							
4	Diagnostic Parameter (MSB)							
5	Diagnostic Parameter							
6	Diagnostic Parameter							
7	Diagnostic Parameter (LSB)							

Field Descriptions

Field	Bytes	Description
Page Code	0	Identifies the type of diagnostic page being returned.
Reserved	1	All reserved bits must be 0.
Page Length	2-3	Indicates the number of bytes of data to be returned after this block.
Diagnostic Parameter	4-7	The results of the Send Diagnostics command test. A code of zero indicates that the drive passed the test. A non zero code indicates that the drive has failed the test. The value returned corresponds to the Message Code described in Appendix A.

Completion Status

Status	Message	Description		
00h	Good Status	♦ The drive is ready to perform any appropriate command. ♦ The drive remains in any previously set mode. ♦ The tape position is not changed.		
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:		
		Code	**Message**	**Description**
		04h	Hardware Error	Drive hardware failure detected.
		05h	Illegal Request	The CDB contains an invalid bit.
		06h	Unit Attention	The cartridge was changed, or the drive was reset prior to this command.

RELEASE UNIT

The Release Unit command releases a current drive reservation, if the command is received from the Initiator that established the reservation.

Any Release Unit command that arrives from other than the originating requester is ignored and Good Status is returned in response to the command.

Third Party reservations are not supported.

It is not an error to attempt to release an ID that is not currently reserved to the requesting Initiator. A reservation cannot be released if the reservation was made by another Initiator. Other events and conditions that can cause a reservation to be released are discussed under the Reserve Unit command.

Command Descriptor Blocks

6-Byte Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (17h)							
1	Ignored LUN			Reserved				
2	Reserved							
3	Reserved							
4	Reserved							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation code for the 6-byte version of Release Unit is 17h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

10-byte Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (57h)							
1	Ignored LUN			Reserved				
2	Reserved							
3	Ignored Third Party Device ID							
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							
8	Reserved							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation code for the 10-byte version of Release Unit is 57h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Ignored Third Party Device ID	3		This field is ignored by the drive.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The drive accepts commands from any Initiator. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 04h Hardware Error Parity error on the SCSI bus or drive hardware failure. 05h Illegal Request The Command Descriptor Block is invalid. 06h Unit Attention The cartridge was changed, or the drive was reset prior to this command.

REPORT DENSITY SUPPORT

The Report Density Support command returns details about the tape formats supported by the drive. The data is returned as a header and a series of descriptor blocks. If the Media flag is set, then one descriptor block is returned with the data for the currently loaded tape. If the Media bit is clear, then one descriptor block is returned for each format supported by the drive.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (44h)							
1	Ignored LUN			Reserved				Media
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	Reserved							
7	Allocation Length, MSB							
8	Allocation Length, LSB							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation code for Report Density is 44h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Media	1	0	0 = Report all densities supported by drive. 1 = Report current media density.
Allocation Length	7-8		Specifies the amount of data to be returned, in bytes.
Reserved			All reserved bits must be 0.
Control	9		See Control Byte Format on page 20.

Report Density Support Data

The Report Density Support returns a header followed by one or more pages of data.

Report Density Support Header

Byte	Bits 7	6	5	4	3	2	1	0
0	Available Density Descriptor Length, MSB							
1	Available Density Descriptor Length, LSB							
2	Reserved							
3	Reserved							

Field Descriptions

Field	Bytes	Bits	Description
Available Density Descriptor Length	0-1		The total amount of data that is available to be returned excluding this field.
Reserved	2-3		All reserved bits are 0.

One or more Report Density Support pages in the format shown below follow the header.

Report Density Support Data Block Descriptor

Byte	Bits 7	6	5	4	3	2	1	0
0	Primary Density Code							
1	Secondary Density Code							
2	WRTOK	DUP	DEFLT	Reserved				
3	Reserved							
4	Reserved							
5	Bits per mm, MSB							
6	Bits per mm							
7	Bits per mm, LSB							
8	Media Width, MSB							
9	Media Width, LSB							
10	Tracks, MSB							
11	Tracks, LSB							
12	Capacity, MSB							
13	Capacity							
14	Capacity							
15	Capacity, LSB							
16-23	Assigning Organization							
24-31	Density Name							
32-51	Description							

Field Descriptions

Field	Bytes	Bits	Description
Primary Density Code	0		40h, indicating Ultrium 1
Secondary Density Code	1		40h, indicating Ultrium 1
WRTOK	2	7	0 = This format can only be read. 1 = This format can be read and written.
DUP	2	6	Always 0, indicating that each density is only reported once.
DEFLT	2	5	0 = Not the density of the current medium. 1 = This is the density of the current medium. This is always 1 for first generation drives since all media is the same format.
Bits per mm	5-7		4880
Media Width	8-9		127
Tracks	10-11		384

Field	Bytes	Bits	Description
Capacity	12-15		Can be one of the following nominal values: 100,000 MB 50,000 MB 30,000 MB 10,000 MB
Assigning Organization	16-23		8 bytes of ASCII data, "LTO-CVE "
Density Name	24-31		8 bytes of ASCII data. Can be one of the following: "U-18-100" "U-18-50 " "U-18-30 " "U-18-10 "
Description	32-51		20 bytes of ASCII data. Can be one of the following: "Ultrium 1/8T 100GB " "Ultrium 1/8T 50GB " "Ultrium 1/8T 30GB " "Ultrium 1/8T 10GB "
Reserved			All reserved bits are 0.

Completion Status

Code	Message	Description		
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The drive accepts commands from any Initiator. • The tape position is not changed.		
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:		
		Code	**Message**	**Description**
		04h	Hardware Error	Parity error on the SCSI bus or drive hardware failure.
		05h	Illegal Request	The Command Descriptor Block is invalid.
		06h	Unit Attention	The cartridge was changed, or the drive was reset prior to this command.

REPORT LUNS

The host uses this command to retrieve information about which Logical Units the drive supports. The allocation length shall be at least 16 bytes. If this is not the case, drive will return Check Condition status and provide a sense key of Illegal Request and additional sense of INVALID FIELD IN CDB.

Command Descriptor Block

The following table shows the layout of the CDB.

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (A0h)							
1	Ignored LUN			Reserved				
2	Reserved							
3	Reserved							
4	Reserved							
5	Reserved							
6	Allocation Length, MSB							
7	Allocation Length							
8	Allocation Length							
9	Allocation Length, LSB							
10	Reserved							
11	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation code for Report LUNS is A0h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Allocation Length	6-9		Specifies the amount of data to be returned, in bytes. Must be at least 16 bytes or the drive will return Check Condition.
Reserved			All reserved bits must be 0.
Control	11		See Control Byte Format on page 20.

Report LUNS Data

The following header is returned by the Report LUNS command.

Byte	Bits 7	6	5	4	3	2	1	0
0	LUN List Length, MSB							
1	LUN List Length							
2	LUN List Length							
3	LUN List Length, LSB							
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							
8-15	LUN 0							

Field Descriptions

Field	Bytes	Bits	Description
LUN List Length	0-3		Always 8, indicating the length of the LUN list, starting in byte 8.
Reserved	4-7		All reserved bits must be 0.
LUN 0	8-15		Always 0, indicating LUN 0.

Future drives may supports multiple Logical Unit Numbers. This would increase the LUN List Length and add additional LUNs to the LUN List after byte 15.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The drive accepts commands from any Initiator. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 04h Hardware Error Parity error on the SCSI bus or drive hardware failure. 05h Illegal Request The Command Descriptor Block is invalid. 06h Unit Attention The cartridge was changed, or the drive was reset prior to this command.

REQUEST SENSE

The Request Sense command returns the status of the last command.

Sense Data is updated with each command; therefore, the sense data only reports the status of the immediately previous command. If a Check Condition status results, a Request Sense command should be issued to recover the information form the Sense Data.

The Request Sense command returns Check Condition status only if a fatal error occurs during execution of the Request Sense command. If nonfatal errors occur during the Request Sense execution, Good Status is returned. Sense Data may be invalid following a fatal error on a Request Sense command.

Sense Data Management

The drive maintains three types of sense data.

♦ Current Sense is sense data associated with the last command received from the initiator.

♦ Deferred Sense is sense data from a command that has been reported as good, but has generated sense data after being reported. This may be a command with the Immediate flag set or may be a buffered write. A command with the Immediate flag set will generate sense for the host that sent the command. A buffered write will generate sense for all hosts.

♦ Unit Attention Sense is sense data generated by a Unit Attention condition. This is generated for all hosts.

Any command other than a Request Sense command or an Inquiry command will generate Check Condition status if there is Deferred Sense data or Unit Attention data available. All commands will generate Check Condition status if the command itself generates sense data. If the next command after the Check Condition status is not a Request Sense command, then all the sense data for that initiator is cleared.

When a Request Sense command is received, the Current Sense is returned. If there is no Current Sense, the Deferred Sense is returned. If there is no Deferred Sense, the Unit Attention Sense is returned. If there is no Unit Attention Sense, default sense data is returned. Once a particular set of sense data has been returned, that sense data is cleared. Any other sense data that is still pending may still cause Check Condition status for subsequent commands.

Command Descriptor Block

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Operation Code (03h)							
1	Ignored LUN			Reserved				
2	Reserved							
3	Reserved							
4	Allocation Length							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation code for Request Sense is 03h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Allocation Length	4		Specifies the amount of data to be returned, in bytes.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

Sense Data Format

The Request Sense command returns sense data in the following format.

Byte	Bits 7	6	5	4	3	2	1	0
0	Valid	Error Code						
1	Segment Number							
2	FM	EOM	ILI	Rsvd	Sense Key			
3	Information, MSB							
4	Information							
5	Information							
6	Information, LSB							
7	Additional Sense Length							
8	Command-specific Information, MSB							
9	Command-specific Information							
10	Command-specific Information							
11	Command-specific Information, LSB							
12	Additional Sense Code							
13	Additional Sense Code Qualifier							
14	Field-Replaceable Unit Code							
15	SKSV	C/D	Reserved		BPV	Bit Pointer		
16	Field Pointer, MSB							
17	Field Pointer, LSB							
18	Reserved							
19	Reserved							
20	Reserved							
21	Reserved				CLN	Reserved		
22-29	Vendor Unique1 (Reserved)							
30-33	Vendor Unique2 (Reserved)							
34-37	Vendor Unique3 (Reserved)							

Field Descriptions

Field	Bytes	Bits	Description
Valid	0	7	0 = The Information field does not contain valid information 1 = The Information field contains valid information This is always 0 for deferred errors.
Error Code	0	0-6	70h = A current error, associated with the most recent command. 71h = A deferred error, not associated with the current command.
Segment Number	1		Always 0, because the Copy, Compare, and Copy and Verify commands are not supported.
FM bit	2	7	1 = A Space, Read, or Verify command did not complete because a file mark was read.
EOM bit	2	6	1 = A Write or Write File Marks command completed in the early warning area. If no other error occurred, the Sense Code will be set to No Sense and the Additional Sense will be set to EOT (0002). If another error occurred, then the Sense Code and Additional Sense will reflect that error.
Incorrect Length Indicator (ILI)	2	5	1 = A Read or Verify ended because a block was read from tape that did not have the block length requested in the command.
Sense Key	2	0-3	This field indicates the status of the last command and provides a generic error category. See Sense Key Values.
Information	3-6		♦ For a Read, Verify or Write with the Fixed flag clear, this field contains the number of bytes in the command less the number of bytes actually processed. ♦ For a Read, Verify, or Write with the fixed flag set, or a Space with the Code set to zero, this field contains the number of blocks in the command less the number of blocks processed. Any block partially transferred in a Read or Write command or partially verified in a Verify command is considered processed but is not included in the calculation. For a Write File Marks or Space command, this field contains the difference between the number of file marks in the command and the number of file marks processed.
Additional Sense Length	7		n-7, indicating the length of the Sense Data.
Command Specific	8-11		Always 0, because no commands use this field.
Additional Sense Code	12		This field provides further detail for the current Sense Key. See Sense Key Values.
Additional Sense Code Qualifier	13		This field provides further detail for the current Additional Sense Code. See Sense Key Values.
Field Replaceable Unit Codes	14		0 = No part of the drive is suspected of failing 1 to *n* = Identifies a part of the drive that is suspected of causing the failure.
SKSV	15	7	0 = Bytes 16-17 contain a message code as defined in Message Codes, below. 1 = Sense Key Specific data in bytes 15-17 is valid and can be used to determine the first parameter that caused an Illegal Request sense key (as defined below).

Field	Bytes	Bits	Description
C/D	15	6	0 = The first error was encountered in the Data-Out Phase.
			1 = The first error was encountered in the Command Descriptor Block.
BPV	15	3	1 = The Bit Pointer field indicates the bit field in error.
Bit Pointer	15	0-2	♦ If BPV is set, this field points to the most significant bit of the field in error.
			♦ When a Log Exception is generated, this field indicates the affected page that caused the Log Exception.
Field Pointer	16-17		♦ If BPV is set, this field points to the most significant byte of the field in error.
			♦ When a Log Exception is generated, bytes 16 and 17 indicate the MSB and LSB of the Log Parameter code that caused the Log Exception. Byte 15 indicates the affected page that caused the Log Exception.
			♦ For all other errors, this field contains message codes as defined in Message Codes, Appendix A.
CLN	21	3	0 = The drive does not need cleaning.
			1 = The drive needs cleaning.
Reserved			All reserved bits are 0.

Sense Key Values

The following table shows the meaning of the Sense Key values. For expanded information, see Additional Sense Codes and Code Qualifiers, below.

Key	Message	Definition
00h	No Sense	The Check Condition occurred in conjunction with detection of FM, EOT, or ILI, or status was not available.
01h	Recovered Error	The Log Sense counter reached its maximum value and the RLEC bit is set.
02h	Not Ready	The drive is not ready to accept tape access commands. Operator intervention may be required to correct this condition, or the drive may be coming ready.
03h	Medium Error	The command terminated with a nonrecoverable error that was probably caused by a flaw in the medium or an error in the recorded data.
04h	Hardware Error	The drive detected a nonrecoverable hardware failure (parity, etc.) while performing the command. Until the cartridge is ejected or a reset is received, the drive continues to return this sense key to any tape motion command.
05h	Illegal Request	The CDB or command parameters contained an illegal parameter.
06h	Unit Attention	One of the following actions occurred: the cartridge was changed; the drive was reset; the operational mode was changed; a Log Exception occurred; or the firmware was changed.
07h	Data Protect	The cartridge is write-protected; the operation was not performed.
08h	Blank Check	A no-data condition was encountered on the tape, or the wrong data format was encountered on tape.
09h	Vendor Specific	Vendor specific conditions.
0Bh	Aborted Command	The drive aborted the command. This key is returned if a bus parity error is detected. The Initiator may be able to recover by trying the command again.
0Dh	Volume Overflow	The drive reached the physical EOT, and write data remains in the buffer.
0Eh	Miscompare	The source data did not match the tape data during a VERIFY command.

Additional Sense Codes and Code Qualifiers

Additional Sense Codes and Additional Sense Codes Qualifiers are returned in the Request Sense data in bytes 12 and 13. These codes are loaded whenever a Check Condition is returned for a SCSI command. The purpose of the codes is to provide more specific error information.

Sense Key Byte 2	ASC Byte 12	ASCQ Byte 13	Message	Explanation
00h No Sense				
00h	00h	00h	No additional sense information	The flags in the sense data indicate the reason for command failure
00h	00h	01h	Filemark detected	A Read or a Space command has terminated early because a file mark has been encountered. The File Mark flag will be set.
00h	00h	02h	EOM detected	A Write or a Write File Marks command ended in the early warning area. The EOM flag will be set.
00h	00h	04h	BOM detected	
00h	00h	17h	Cleaning requested	
00h	5Dh	00h	Failure prediction threshold exceeded	
00h	5Dh	FFh	Failure prediction threshold exceeded false	
00h	70h	00h	Decompression exception short algorithm id of nn	
01h Recovered Error				
01h	00h	17h	Cleaning requested	
01h	18h	01h	Recovered data with error correction and retries	
01h	37h	00h	Rounded parameter	A Mode Select command parameter has been rounded because the drive cannot store it with the accuracy of the command
01h	3Fh	00h	Target operation conditions have changed.	CM inquiry failure detected
01h	5Bh	01h	Threshold condition met	
01h	5Bh	02h	Log counter at maximum	
01h	5Dh	00h	Failure prediction threshold exceeded	Failure Prediction thresholds have been exceeded indicating that a failure may occur soon.
01h	5Dh	FFh	Failure prediction threshold exceeded false	
01h	70h	00h	Decompression exception short algorithm id of nn	
02h Not Ready				
02h	04h	00h	LUN not ready CNR	Cause Not Reportable - A tape is present in the drive, but it is in the process of being unloaded.
02h	04h	01h	LUN not ready POBR	Process of Becoming Ready - A medium access command has been received during a front panel initiated load or an immediate reported load command

Sense Key Byte 2	ASC Byte 12	ASCQ Byte 13	Message	Explanation
02h	04h	02h	LUN not ready ICR	Initializing Command Required - A tape is present in the drive, but it is not logically loaded. A Load command is required.
02h	04h	03h	LUN not ready MIR	Manual Intervention Required
02h	04h	10h	LUN not ready AMNA	Auxiliary Memory Not Accessible
02h	30h	00h	Incompatible medium installed	
02h	30h	03h	Cleaning cartridge installed	An operation could not be carried out because the tape in the drive is a cleaning cartridge.
02h	30h	04h	Cannot write medium unknown format	
02h	30h	07h	Cleaning failure	A cleaning operation was attempted, but could not be completed for some reason
02h	3Ah	00h	Medium not present	A media access command has been received when there is no tape loaded
02h	3Ah	03h	Medium not present, but loadable	A media access command has been received when the is tape is loadable.
02h	3Ah	04h	Medium not present, Medium Auxiliary Memory Accessible	A media access command has been received when the tape seated but not loaded. The MAM is accessible.
02h	3Eh	00h	Logical unit has not self configured yet	The drive has just powered on and has not completed its self-test sequence and cannot process commands.
02h	3Eh	02h	Timeout on logical unit	
02h	4Ch	00h	LUN failed self configuration	
02h	53h	00h	Media load or eject failed	
02h	5Ah	01h	Operator medium removal request	
03h Medium Error				
03h	00h	02h	EOM detected	A Read or a Space command terminated early because End of Tape was encountered. The EOM flag will be set.
03h	00h	04h	BOM detected	A Space command terminated early because beginning of tape was encountered. The EOM flag will be set
03h	03h	02h	Excessive write errors	
03h	09h	00h	Track following error	
03h	0Ch	00h	Write error	A Write operation has failed. This is probably due to bad media, but may be hardware related.
03h	0Ch	0Bh	Auxiliary memory write error	
03h	11h	00h	Unrecovered read error	A Read operation failed. This is probably due to bad media, but may be hardware related.

Sense Key Byte 2	ASC Byte 12	ASCQ Byte 13	Message	Explanation
03h	11h	01h	Read retries exhausted	
03h	11h	02h	Error too long to correct	
03h	11h	12h	Auxiliary memory read error	
03h	14h	00h	Recorded entity not found	A Space or Locate failed because a format violation prevented the target of the operation from being found.
03h	14h	01h	Record not found	
03h	30h	00h	Incompatible medium installed	
03h	30h	02h	Cannot read medium incompatible format	An operation could not be completed because the Logical Format is not correct.
03h	30h	07h	Cleaning failure	
03h	30h	80h	Firmware tape fail	
03h	31h	00h	Medium format corrupted	Data could not be read because the format on tape is not valid, but is a known format
03h	3Bh	00h	Sequential positioning error	A command has failed and left the logical position at an unexpected location
03h	3Bh	01h	Tape position error at BOM	
03h	3Bh	02h	Tape position error at EOM	
03h	3Bh	08h	Reposition error	
03h	50h	00h	Write append error	A Write type command failed because the point at which to append data was unreadable.
03h	50h	01h	Write append position error	
03h	51h	00h	Erase failure	
03h	52h	00h	Cartridge fault	A command could not be completed due to a fault in the tape cartridge
03h	52h	01h	Media end of life	
03h	53h	00h	Media load or eject failed	An attempt to load or eject the tape failed due to a problem with the tape
03h	53h	01h	Unload tape failure	
03h	70h	00h	Decompression exception short algorithm id of nn	
04h Hardware Error				
04h	15h	01h	Mechanical positioning error	
04h	40h	BDh	HE diagnostic task time-out	
04h	44h	00h	HE internal target failure	
04h	44h	D0h	AIC interrupt DMA FIFO overrun or underrun	
04h	44h	D1h	AIC interrupt DMA offset error	

Sense Key Byte 2	ASC Byte 12	ASCQ Byte 13	Message	Explanation
04h	44h	D2h	AIC interrupt DMA parity error	
04h	44h	D3h	AIC interrupt read parity error	
04h	44h	D4h	Diagnostic cache test failed	
04h	51h	00h	Erase failure	An Erase command failed to erase the required area on the medium.
04h	52h	00h	Cartridge fault	The tape is snapped
04h	53h	00h	Media load or eject failed	An attempt to load or eject the tape failed due to a problem with the drive
05h Illegal Request				
05h	1Ah	00h	Parameter list length error	The amount of data sent in a Mode Select or Log Select command is incorrect
05h	20h	00h	Invalid command operation code	The Operation Code in the command was not a valid Operation Code
05h	21h	01h	Invalid element address	
05h	24h	00h	Invalid field in CDB	An invalid field has been detected in a Command Descriptor Block.
05h	25h	00h	LUN not supported	The command was addressed to a non-existent logical unit number.
05h	26h	00h	Invalid field in parameter list	An invalid field has been detected in the data sent during the data phase
05h	26h	02h	Parameter value invalid	Firmware download flash failure.
05h	26h	04h	Invalid release of persistent reservation	
05h	26h	098h	Invalid field parameter checksum	Microcode image invalid, bad checksum or CRC.
05h	3Bh	0Ch	Position past beginning of medium	
05h	53h	02h	Medium removal prevented	An Unload command has failed to eject the tape because medium removal has been prevented.
05h	55h	04h	Insufficient registration resource	
06h Unit Attention				
06h	04h	10h	Auxiliary Memory not accessible	An access attempt was made to the Medium Auxiliary Memory or the EEPROM that was not successful.
06h	28h	00h	Not ready to ready transition	A tape has been loaded successfully into the drive and is now ready to be accessed.
06h	29h	00h	Power on reset or bus device reset occurred	The drive has powered on, received a reset signal or a bus device reset message since the initiator last accessed it
06h	2Ah	01h	Mode parameters changed	An initiator other than the one issuing the command has changed the Mode parameters for the drive.

Sense Key Byte 2	ASC Byte 12	ASCQ Byte 13	Message	Explanation
06h	2Ah	02h	Log parameters changed	
06h	2Ah	04h	Reservations released	
06h	2Ah	05h	Registration preempted	
06h	3Fh	01h	Microcode has been changed	The firmware in the drive has just been changed by a Write Buffer command or firmware tape.
06h	3Fh	0Eh	Reported LUNs Data Has Changed	Command Forwarding has been changed from disabled to enabled or vice-versa.
06h	3Fh	10h	Media Loadable	Medium has transistioned to a loadable state.
06h	3Fh	11h	Auxiliary Cartridge Memory accessible.	Medium has transistioned to MAM accessible state from a MAM inaccessible state.
06h	5Bh	01h	Threshold condition met	
06h	5Dh	00h	Failure prediction threshold exceeded	
06h	5Dh	FFh	Failure prediction threshold exceeded false	A Mode Select command has been used to test for Failure Prediction system.
06h	67h	00h	Power on reset or bus device soft reset occurred	
07h Data Protect				
07h	27h	00h	Write protected	A Write type operation has been requested on a tape that has been write protected.
07h	30h	00h	Incompatible medium installed	A Write type operation could not be executed because it is not supported on the tape type that is loaded
08h Blank Check				
08h	00h	05h	EOD detected	A Read or a Space command terminated early because End of Data was encountered.
08h	14h	03h	EOD not found	A Read type operation failed because a format violation related to a missing EOD data set
08h	30h	01h	Cannot read medium unknown format	
08h	30h	02h	Cannot read medium incompatible format	
09h Vendor Unique				
09h	00	05	VS EOD detected	Raw reader
09h	80	80	VS Medium is present	Park Unpark command
0Bh Aborted Command				
0Bh	08h	01h	LUN communication time out	
0Bh	1Bh	00h	Synchronous data transfer error	
0Bh	3Dh	00h	Invalid bits in identify message	An illegal Identify message has been received by the drive at the start of a command.

Sense Key Byte 2	ASC Byte 12	ASCQ Byte 13	Message	Explanation
0Bh	43h	00h	Message error	A message could not be sent or received due to excessive transmission errors.
0Bh	45h	00h	Select or reselect failure	An attempt to reselect an initiator in order to complete the command has failed.
0Bh	47h	00h	SCSI parity error	
0Bh	48h	00h	Initiator detected error message received	A command failed because an Initiator Detected Error message was received.
0Bh	49h	00h	Invalid message error	The command failed because an invalid message was received by the drive.
0Bh	4Ah	00h	Command phase error	A command could not be executed because too many parity errors occurred in the Command phase
0Bh	4Bh	00h	Data phase error	A command could not be completed because too many errors occurred during the Data phase.
0Bh	4Eh	00h	Overlapped commands attempted	An initiator selected the drive even though it already had a command outstanding in the drive.
0Bh	5Ah	01h	Operator medium removal request	The command was aborted because the eject button was pressed.
0Dh Volume Overflow				
0Dh	00h	02h	EOM detected	A Write or Write File Marks command failed because the physical end of tape was encountered. The EOM flag will be set.

Message Codes

The table in Appendix A: Message Codes, beginning on page 137, lists the vendor unique message codes that are returned in the Field Pointer field (bytes 16-17) when the SKSV bit is 0.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 05h Illegal Request The Command Descriptor Block is invalid.

RESERVE UNIT

The Reserve Unit command reserves the drive for exclusive use of the requesting Initiator.

The drive reservation once established, remains in effect until one of the following occurs:

- Another Reserve Unit command arrives from the same Initiator that requested the current reservation. The new reservation supersedes the current one and may be the same as the current one. Redundant use of the command is not considered an error.

- A Release Unit command arrives from the same Initiator that requested the current reservation. The drive returns to unreserved mode.

- A Bus Device Reset Message arrives from any Initiator.

- A Reset condition occurs.

- Firmware is updated.

When the drive is reserved, it returns Reservation Conflict Status in response to most commands received from excluded Initiators. Inquiry, Request Sense, Prevent Medium Removal (with a prevent bit of zero), and Release Unit commands are accepted from any initiator.

Command Descriptor Block

6-Byte Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (16h)							
1	Ignored LUN			Reserved				
2	Reserved							
3	Reserved							
4	Reserved							
5	Control							

Field Descriptions for 6-Byte Command

Field	Bytes	Bits	Description
Operation Code	0		The Operation code for the 6-byte version of Reserve Unit is 16h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

10-byte Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (56h)							
1	Ignored LUN			Reserved				
2	Reserved							
3	Ignored Third Party Device ID							
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							
8	Reserved							
9	Control							

Field Descriptions for 10-Byte Command

Field	Bytes	Bits	Description
Operation Code	0		The Operation code for the 10-byte version of Reserve Unit is 57h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Ignored Third Party Device ID	3		This field is ignored by the drive.
Reserved			All reserved bits must be 0.
Control	9		See Control Byte Format on page 20.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The drive is reserved for the use of the specified ID. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 02h Not Ready — No cartridge is in the drive. 03h Media Error — Unrecoverable data error encountered. 04h Hardware Error — Parity error on the SCSI bus or drive hardware failure. 05h Illegal Request — The Command Descriptor Block is invalid. 06h Unit Attention — The cartridge was changed, or the drive was reset prior to this command.
18h	Reservation Conflict	The drive is reserved for another initiator.

REWIND

The Rewind command requests that the medium be positioned to the Beginning Of Tape (BOT). Prior to performing the Rewind operation, the buffered data and filemarks are written to the tape, and an EOD marker is recorded. The Rewind operation is done at high speed.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (01h)							
1	Ignored LUN			Reserved				Immed
2	Reserved							
3	Reserved							
4	Reserved							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation code for Rewind is 01h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Immed	1	0	Immediate bit: 0 = Status is not returned the rewind operation has completed. 1 = Status is returned as soon as all buffered data and filemarks have been written to the medium and the Rewind CDB has been validated.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

If Check Condition status is returned from Rewind command with the Immed bit set to 1, then the rewind operation is not performed.

Rewind Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape position is BOT (if not an Immediate command). Note: If IMMED is one, then Good Status only indicates that all buffered data and filemarks have been written to the medium and that the Rewind CDB is valid.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message** **Description** 02h Not Ready No cartridge is in the drive. 03h Media Error Unrecoverable data error encountered. 04h Hardware Error Parity error on the SCSI bus or drive hardware failure. 05h Illegal Request The Command Descriptor Block is invalid.

SEND DIAGNOSTIC

The Send Diagnostic command requests the drive to perform diagnostic operations on itself. The diagnostic tests are part of the drive's resident firmware.

The Receive Diagnostic Results command may be used to retrieve the result of the diagnostic operations.

A Self Test bit of one requests the drive to perform its self test diagnostic.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (1Dh)							
1	Self-Test Code			PF	Rsvd	Selftest	Devoffl	UnitOffl
2	Reserved							
3	Parameter List Length (MSB)							
4	Parameter List Length (LSB)							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description	
Operation code	0		The Operation Code for Send Diagnostic is 1Dh.	
Self-test code	1	5-7	This bit field is not supported and must be set to 0.	
Pf	1	4	This bit is not supported and must be set to 0.	
Selftest	1	2	Self test diagnostics.	Mode 0: supported
Devoffl	1	1	Device off-line.	Mode 4: Perform self test diagnostics;
UnitOffl	1	0	Unit off-line.	Mode 5: Write with incrementing pattern; Mode 6: Verify with incrementing pattern; Mode 7: Write and verify with incrementing pattern
			Mode 0: Selftest = 0 Devoffl = 0 UnitOffl = 0	
			Mode 4: Selftest = 1 Devoffl = 0 UnitOffl = 0	
			Mode 5: Selftest = 1 Devoffl = 0 UnitOffl = 1	
			Mode 6: Selftest = 1 Devoffl = 1 UnitOffl = 0	
			Mode 7: Selftest = 1 Devoffl = 1 UnitOffl = 1	
Parameter list length	3-4		This field is not supported and must be to 0.	
Reserved			All reserved bits must be 0.	
Control	5		The control field must be 0.	

Send Diagnostic Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: **Code** **Message Description** 02h Not Ready No cartridge is inserted in the drive. 04h Hardware Error Drive hardware failure detected. 05h Illegal Request The CDB contains an invalid bit. 06h Unit Attention The cartridge was changed, or the drive was reset prior to this command.

SET CAPACITY

The Set Capacity command sets the available medium for a volume to a proportion of the total capacity of that volume. Any excess space is unavailable on the volume after successful completion of this command until reset by a new Set Capacity command.

The Set Capacity command is valid only when the medium is at beginning-of-medium. If the medium is logically at any other position, the command is rejected with Check Condition status. The sense key is Illegal Request with the additional sense code and an additional sense code qualifier set to position past beginning of medium.

If the medium is write protected, the command is rejected with Check Condition status. The sense key is Data Protect with the additional sense code and an additional sense code qualifier set to Write Protected.

If the Set Capacity command specifies the portion of the total volume capacity to be made available for use less than 10 gigabytes, the device will round up the capacity to 10 gigabytes. The command is terminated with Check Condition status. The sense key is Recovered Error with the additional sense code and an additional sense code qualifier set to Rounded Parameter.

A valid Set Capacity command causes all data on the tape to be lost.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (0Bh)							
1	Ignored LUN			Reserved				Immed
2	Reserved							
3	Capacity Proportion Value, MSB							
4	Capacity Proportion Value, LSB							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Set Capacity is 0Bh.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Immed	1	0	0 = Status is not returned until the operation is complete 1 = Status is returned as soon as the operation is initiated.
Capacity Proportion Value	3-4		This field specifies the portion of the total tape capacity to be made available for use. The Capacity Proportion Value is the numerator of a fraction with a denominator of 65535. The resulting available tape capacity is equal to the total tape capacity multiplied by this fraction. The drive rounds up the capacity to the next higher supported value.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

The Set Capacity command sets the available tape capacity to:

Tape Capacity = Total Tape Capacity $\times$ Capacity Proportion Value / 65535

Completion Status

Code	Message	Description
00h	Good Status	♦ The drive is ready to perform any appropriate command. ♦ The drive remains in any previously set mode. ♦ The tape position is at BOT. ♦ Data on tape is logically inaccessible. Note: If Immed is 1, then Good Status only indicates that the command is valid.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: <table><tr><td>Code</td><td>Message</td><td>Description</td></tr><tr><td>01h</td><td>Recovered Error</td><td>Tape capacity is rounded up to 10% of total capacity.</td></tr><tr><td>02h</td><td>Not Ready</td><td>No cartridge is in the drive.</td></tr><tr><td>04h</td><td>Hardware Error</td><td>Drive hardware failure detected.</td></tr><tr><td>05h</td><td>Illegal Request</td><td>The tape is not at BOT or the Command Descriptor Block is not valid.</td></tr><tr><td>06h</td><td>Unit Attention</td><td>The cartridge was changed or the drive was reset prior to this command.</td></tr><tr><td>07h</td><td>Write Protected</td><td>The cartridge is write-protected.</td></tr></table>

SPACE

The Space command uses three methods to move the tape. This command moves the position:

- Forward or backward a specified number of blocks.
- Forward or backward a specified number of filemarks.
- Forward to the end of recorded data (EOD).

If the target block or filemark is in the buffer of the drive, no tape motion results, otherwise, spacing is done at high search speed.

Command Descriptor Block

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Operation Code (11h)							
1	Ignored LUN			Reserved		Code		
2	Count, MSB							
3	Count							
4	Count, LSB							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Space is 11h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Code	1	0-2	000b = Move Count blocks 001b = Move Count filemarks 011 = Move to end of recorded data (EOD)
Count	2-4		This field specifies the number of blocks or filemarks to space over. A positive Count moves the tape forward. A negative (2's complement) Count moves the tape backward. A zero Count causes no media movement and is not an error. For Space to EOD operation, this field is ignored.
Reserved			All reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

The Space command instructs the drive to set a new logical position relative to the current logical position. How this is done is dependent on the value of the Code field and the Count field. The Count field is a signed value indicating the distance to move, negative indicating movement towards BOT and positive indicating movement towards EOT.

If the Code field is 000b, then the logical position is moved the number of blocks indicated by the Count field. If a file mark is detected between the current logical position and the requested logical position, the new logical position is set to immediately after the file mark in the direction of the space operation. If BOT or EOD is detected before the requested logical position, then the logical position is set to that position.

If the Code field is 001b, then the logical position is moved the number of file marks indicated by the Count field. If BOT or EOD is detected before the requested logical position, then the logical position is set to that position.

If the Code field is 011b, then the logical position is set to after the last valid block on tape. In this case the count field is ignored.

Any other value of the Code field will cause Check Condition status to be returned. Spacing to sequential file marks is not supported. Set marks are not supported. The Sense Key is set to Illegal Request and the Additional Sense is set to Invalid field in CDB (2400).

Space-by-Count Functions

The Count field indicates both direction and number of blocks or filemarks to space over from the current logical position. A positive value N in the Count field moves the tape forward over N blocks or filemarks. A negative value -N (2's complement) in the Count field moves the tape backward over N blocks or filemarks. Zero in the count field causes no tape movement and is not considered an error.

When there are no exception conditions during space functions, forward tape motion ends on the EOT side of the last block or filemark and reverse motion ends on the BOT side of the last block or filemark.

- If a filemark is encountered while spacing over blocks, a Check Condition Status is returned. The Sense FM bit is set and the Sense Valid bit is set, indicating Residual Length is non-zero.

  The Residual Length equals the difference in the requested count and the actual number of blocks spaced over not including the filemark. The tape is positioned on the logical EOT side of the filemark if movement was forward or on the logical BOT side of the filemark if movement was reverse.

- If EOD is encountered while spacing forward, Check Condition is returned with 08h Sense Key. Extended Sense Valid bit is set, indicating Residual Length is nonzero.

- If BOT is encountered while spacing in reverse, Check Condition is returned with 40h Sense Key. Extended sense Valid bit is set, indicating a nonzero Residual Length.

- If EOT is encountered while spacing forward, Check Condition is returned with 40h or 43h Sense Key. Extended Sense Valid bit is set, indicating a nonzero Residual Length.

- If an unrecoverable data error is encountered, Check Condition is returned, Extended Sense Key is set to Medium Error, and Extended Sense Valid bit is set, indicating Residual Length is nonzero.

Space to EOD

The Count field is ignored in the space-to-EOD function.

In the space-to-EOD function, the tape is positioned such that a subsequent WRITE command appends data to the last recorded information on the tape. This positioning is done at high search speed.

The space-to-EOD function is useful in support of user-defined directories located at the end of recorded data.

- If physical EOT is encountered while spacing to end of data, Check Condition Status is returned and Extended Sense is set to Medium Error.

- If unrecoverable data error is encountered, Check Condition Status is returned, Extended Sense Key is set to Medium Error, and Extended Sense Valid bit is set, indicating Residual Length is non-zero.

Completion Status

Code	Message	Description		
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape is positioned on the EOT side if space forward and on the BOT side if space reverse.		
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:		
		Code	**Message**	**Description**
		02h	Not Ready	No cartridge is inserted in the drive.
		03h	Media Error	Unrecoverable data error encountered while performing a Space command.
		04h	Hardware Error	Drive hardware failure detected.
		05h	Illegal Request	The Command Descriptor Block is invalid.
		06h	Unit Attention	The cartridge was changed or the drive was reset prior to this command.
		08h	Blank Check	EOD was encountered while executing a Space forward.

TEST UNIT READY

The Test Unit Ready command provides a means to check that the drive is ready.

If the drive is able to accept a medium-access command without returning a Check Condition status, then the Test Unit Ready command will result in Good status.

If the drive is unable to become operational or is in a state that requires action from the host to make the drive ready, then the Test Unit Ready command will result in a Check Condition status with a sense key of Not Ready.

This command does not access the medium or initiate a diagnostic routine.

Command Descriptor Block

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Operation Code (00h)							
1	Ignored LUN			Reserved				
2	Reserved							
3	Reserved							
4	Reserved							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Test Unit Ready is 00h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Reserved			All reserved bits must be 0.
Control	5		The control field must be 0.

Completion Status

Code	Message	Description		
00h	Good Status	• The drive is ready to perform any appropriate medium access command. • The drive remains in any previously set mode. • The tape is not moved.		
02h	Check Condition	Use the Request Sense command to retrieve the sense data.		
		Code	Message	Description
		02h	Not Ready	No cartridge is present; an immediate command is in progress; or the eject button has been pressed.
		04h	Hardware Error	Parity error on the SCSI bus or drive hardware failure.
		05h	Illegal Request	The Command Descriptor Block is invalid.
		06h	Unit Attention	The cartridge was changed or the drive was reset.

VERIFY

The Verify command verifies one or more blocks of data beginning with the next block from the tape unit.

The command terminates after the specified number of bytes or blocks are verified or when the drive encounters a filemark, the EOD, the EOT, or an unrecoverable error. On completion the medium is positioned after the last block verified, after the end-of-data, after a filemark or after an unrecoverable block.

If a Verify with a zero verification length is issued, no data is verified, and the current position on the tape does not change. This condition is not considered an error.

The Verify command causes data to be read from the tape and passed through the drive's error detection and correction hardware to determine whether it can be recovered from the tape. The amount of data to be read is indicated by the Verification Length field and the Fixed flag in the same manner as is used in a Read command.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (13h)							
1	Ignored LUN			Reserved				Fixed
2	Verification Length, MSB							
3	Verification Length							
4	Verification Length, LSB							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Verify is 00h.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Fixed	1	0	0 = Variable block length. Verify Length contains the number of bytes to return. 1 = Fixed block length, as specified by the MODE SELECT Block Descriptor. Verify Length contains the number of blocks to return
Verify Length	2-4		This field specifies the number of bytes (Fixed = 0) or blocks (Fixed = 1) to be verified. A transfer length of 0 is valid and no data is verified.
Reserved			All reserved bits must be 0.
Control	5		The control field must be 0.

Verify Command Operation

When the Fixed bit is set, the Verify Length specifies the number of contiguous blocks to be verified on the tape. When the Fixed bit is cleared, the Verify Length specifies the number of bytes in the block to verify.

The byte compare starts on a block boundary starting at the current tape block position.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape is positioned on the EOT side of the last block verified.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:

Code	Message	Description
02h	Not Ready	No cartridge is in the drive.
03h	Media Error	Unrecoverable data error encountered.
04h	Hardware Error	Parity error on the SCSI bus or drive hardware failure.
05h	Illegal Request	The Command Descriptor Block is invalid.
06h	Unit Attention	The cartridge was changed, or the drive was reset prior to this command.
08h	Blank Check	EOD was encountered..

WRITE

The Write command transfers one or more data blocks from the Initiator to the drive. If the Transfer Length is zero, no data is transferred, and the current position of the tape is not changed. This condition is not considered an error.

Command Descriptor Block

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Operation Code (0Ah)							
1	Ignored LUN			Reserved				Fixed
2	Transfer Length, MSB							
3	Transfer Length							
4	Transfer Length, LSB							
5	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The Operation Code for Write is 0Ah.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Fixed	1	0	0 = Variable block length. Transfer Length contains the number of bytes to write. 1 = Fixed block length, as specified by the MODE SELECT Block Descriptor. Transfer Length contains the number of blocks to write.
Transfer Length	2-4		This field specifies the number of bytes (Fixed = 0) or blocks (Fixed = 1) to be written. A transfer length of 0 is valid and no data is written.
Reserved			All reserved bits must be 0.
Control	5		The control field must be 0.

If the Fixed flag is clear, the initiator will transfer a single block of the length indicated in Transfer Length.

If the Fixed flag is set, the initiator will transfer a sequence of blocks. The Transfer Length field gives the number of blocks. The current fixed block length gives the length of the blocks.

At Early Warning, the drive completes the current block transfer and terminates the command with a Check Condition, EOM bit set, and Sense Key equal to 0.

Subsequent Write commands complete with a Check Condition and the EOM bit set.

If writing the buffer to tape is unsuccessful because of EOT, a Volume Overflow is reported. The Residual count field in the Request Sense data reports the amount of data not transferred. Writing can continue in the Early Warning region until EOT is encountered. Any Write command issued within Early Warning and successfully completed, finishes with a Check Condition and the EOM bit set.

Completion Status

Code	Message	Description
00h	Good Status	• The SCSI data has been transferred to the data buffer. • The drive remains in any previously set mode.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:

Code	Message	Description
02h	Not Ready	No cartridge is in the drive.
03h	Media Error	Unrecoverable data error encountered.
04h	Hardware Error	Parity error on the SCSI bus or drive hardware failure.
05h	Illegal Request	The Command Descriptor Block is invalid.
06h	Unit Attention	The cartridge was changed, or the drive was reset prior to this command.
07h	Write Protect	The tape is write-protected; check the cartridge before continuing.
0Dh	Volume Overflow	The Write command completed with data in the buffer because the end-of-partition was encountered.

WRITE BUFFER

The Write Buffer command is used in conjunction with the Read Buffer command as a diagnostic function for testing the data buffer memory of the drive and confirming the SCSI bus integrity. The medium is not accessed during the execution of this command.

The Write Buffer command is also used to download microcode to the drive.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (3B)							
1	Ignored LUN			Rsvd	Mode			
2	Buffer ID							
3	Buffer Offset, MSB							
4	Buffer Offset							
5	Buffer Offset, LSB							
6	Parameter List Length, MSB							
7	Parameter List Length							
8	Parameter List Length, LSB							
9	Control							

Field Descriptions

Field	Bytes	Bits	Description
Operation Code	0		The operation code for Write Buffer is 3Bh.
Ignored Logical Unit	1	5-7	The LUN field is vestigal from the SCSI-1 standard and is ignored.
Reserved	1	4	All Reserved bits must be 0.
MODE	1	0-3	0000b = Write header and data. 0001b = Write Medium Auxiliary Memory(MAM). 0010b = Write data only. 0100b = Microcode download. Do not write to flash memory. 0101b = Microcode download. Write to flash memory. 0110b = Microcode download. Do not write to flash memory. 0111b = Microcode download. Write to flash memory.
Buffer ID			00h = normal access (default) 54h = specifies access to Medium Auxiliary Memory
BUFFER OFFSET	3-5		For Mode not equal to 0001b: The offset from the beginning of the specified buffer in bytes. For Mode equal 0001b: Set to the Medium Auxiliary Memory as described in the tables.
PARAMETER LIST LENGTH	6-8		Specifies the amount of data to be sent. A value of 0 is a valid entry and shall not be considered an error. This value must be smaller than the difference between the Buffer Offset and the size of the buffer.
CONTROL	9		See Control Byte Format on page 20.

A Mode field of 0000b indicates that the data to be written will be preceded with a four-byte header. This Write Buffer Data Header is reserved and must be set to all zeros. The header will not be placed into buffer memory.

A Mode field of 0001b indicates that data to be written to the Medium Auxiliary Memory will be sent. If the optional Application Specific page does not exist in the MAM then a Write Buffer command to this page will create it prior to writing data.

A Mode field of 0010b indicates that only data to be written to the buffer will be sent.

A Mode field of 0100b or 0110b indicates download microcode.

A Mode field of 0101b or 0111b indicates download microcode and save.

The Buffer ID field indicates which buffer is to be written. All drives support buffer 0. Other buffers may be available in the drive.

The Buffer Offset is used to specify the byte location within the specified buffer where data is to be written.

The Parameter List Length field indicated the amount of data to be transferred. Care needs to be taken so that the Buffer Offset plus the Parameter List Length does not exceed the buffer capacity. If the buffer capacity is exceeded, no data is written and Check Condition status is generated.

Soft Microcode Download

A soft microcode download will load the microcode image and reboot the drive without flashing the image into memory.

Use Mode field of 0100b or 0110b to download the microcode image into memory without saving (flashing). Buffer Offsets may be used in either of these Modes.

After the downloaded microcode image is in memory, it may be booted (without flashing) by issuing a Write Buffer command with Mode 0100b or 0110b and a Parameter List Length of zero. The downloaded code will then run on the drive until the drive is power cycled. Upon power cycling the drive, the original firmware revision will be restored.

Hard Microcode Download

A hard microcode download will load the microcode image, flash it into memory and reboot the drive.

Use Mode field of 0100b or 0110b to download the microcode image into memory without saving (flashing). Buffer Offsets may be used in either of these Modes.

After the downloaded microcode image is in memory, it may be flashed and booted by issuing a Write Buffer command with Mode 0101b or 0111b and a Parameter List Length of zero. The downloaded code will then run on the drive and remain in memory until a subsequent hard microcode download is done.

Write Buffer Data Header

If the Mode field is set to 0000b, then the data sent must be preceded by a 4 byte Write Buffer Data Header. The following table shows the fields in the Write Buffer Data Header.

Byte	Bits							
	7	6	5	4	3	2	1	0
0	Reserved							
1	Reserved							
2	Reserved							
3	Reserved							

Field Descriptions

Field	Bytes	Bits	Description
Reserved	0-3		All bits are 0.

Completion Status

Code	Message	Description
00h	Good Status	• The drive is ready to perform any appropriate command. • The drive remains in any previously set mode. • The tape position is not changed.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are:

Code	Message	Description
04h	Hardware Error	Drive hardware failure detected.
05h	Illegal Request	The Command Descriptor is invalid, the transfer length exceeds the maximum, or the microcode file is invalid.
06h	Unit	The cartridge was changed, or the drive was reset prior to this command. Microcode image has been changed.

WRITE FILE MARKS

The Write Filemarks command causes the specified number of filemarks to be written to tape.

This command can be used to force all remaining buffered data blocks to be written to tape without appending filemarks by specifying zero filemarks. When zero filemarks are specified, the command does not return Good Status to the Initiator until all buffered data blocks and filemarks are written correctly on the tape. Otherwise, status is returned immediately.

Command Descriptor Block

Byte	Bits 7	6	5	4	3	2	1	0
0	Operation Code (10h)							
1	Reserved							Immed
2	Count, MSB							
3	Count							
4	Count, LSB							
5	Control							

Field Descriptions

Field Name	Bytes	Bits	Description
Operation Code	0		The Operation Code for Write Filemarks is 10h.
Immed	1	0	0 = Status is not returned until the tape is positioned.
			1 = Status is returned as soon as the operation is initiated.
Count	2-4		The number of filemarks to record.
Reserved			All Reserved bits must be 0.
Control	5		See Control Byte Format on page 20.

The Write File Marks command causes a sequence of file marks to be written at the current logical position. The number of file marks to be written is indicated in the Count field.

If the Immed flag is set, status is returned immediately, before the file marks are written to tape. If the Immed flag is clear, the file marks and any buffered data is written to tape before status is returned. If the Immed flag is clear and the Count field is 0, then all buffered data is flushed to tape before the command is reported.

Completion Status

Code	Message	Description
00h	Good Status	• The filemarks have been sent to the buffer. • The drive remains in any previously set mode. Note: If Immed is 1, then Good Status only indicates that the command is valid.
02h	Check Condition	Use the Request Sense command to retrieve status information. Possible Sense Keys are: | Code	Message	Description
02h	Not Ready	No cartridge is in the drive.
03h	Media Error	Unrecoverable data error encountered.
04h	Hardware Error	Parity error on the SCSI bus or drive hardware failure.
05h	Illegal Request	The Command Descriptor Block is invalid.
06h	Unit Attention	The cartridge was changed, or the drive was reset prior to this command.
07h	Write Protect	The tape is write-protected; check the cartridge before continuing.
0Dh	Volume	The command completed with Overflow data in the buffer because EOT was encountered.	

Appendix A: Message Codes

This table lists the vendor unique message codes that are returned by the Request Sense command in the Field Pointer field (bytes 16-17) when the SKSV bit is 0.

Message	VSCQ	Type	Definition
GOOD_STATUS	00h	General	Good status
BUSY_STATUS	01h	General	Busy status
ILLEGAL_COMMAND_STATUS	02h	General	Illegal command status
COMMAND_ABORTED_STATUS	03h	General	Command aborted status
BAD_STATUS	04h	General	Bad status
FAILED_STATUS	08h	General	Failed status
ILLEGAL_MESSAGE	09h	General	Illegal message
LOGICAL_EW_STATUS	0Bh	General	Logical EW status
BOP_STATUS	0Ch	General	BOP status
REWRITE_RECOVERED_STATUS	0Dh	General	
SCSI_BOR_ERR	40h	SCSI	Additional Vendor Specific ASCQ BOR error
SCSI_CRC_ERR	41h	SCSI	CRC error
SCSI_INDETERMINATE_IRQ	42h	SCSI	Unknown IRQ
SCSI_SAPI_FAILED	43h	SCSI	SAPI routine failed
SCSI_KERNEL_MSG_FAILED	44h	SCSI	Receiving kernel message failed
SCSI_UNKNOWN_BE_STATE	45h	SCSI	Unknown BE state
SCSI_UNKNOWN_FE_STATE	46h	SCSI	Unknown FE state
SCSI_UNKNOWN_SCSI_INT	47h	SCSI	Kernel Message: Unknown SCSI interrupt (unknown SCSI kernel message type)
SCSI_UNKNOWN_KERNEL_MSG_TYPE	48h	SCSI	Kernel Message: Unknown kernel message type
SCSI_UNKNOWN_SENDER	49h	SCSI	Kernel Message: Unknown kernel message sender
SCSI_UNKNOWN_SCSI_MSG	4Ah	SCSI	Kernel Message: Unknown SCSI message
SCSI_UNKNOWN_SVA_MSG	4Bh	SCSI	Kernel Message: Unknown SERVO ALERT message
SCSI_UNKNOWN_DMA_MSG	4Ch	SCSI	Kernel Message: Unknown DMA message
SCSI_TIMER_FAILED	4Dh	SCSI	Timer failed
SCSI_ZERO_TRANSFER	4Eh	SCSI	SAPI transfer with zero length
SCSI_UNEXP_CCSTARTED	4Fh	SCSI	Unexpected COMMAND COMPLETE started
SCSI_UNEXP_CCNOTSTARTED	50h	SCSI	Unexpected COMMAND COMPLETE not started
SCSI_FE_STATE_NOT_MATCHED	51h	SCSI	Unexpected FE state
SCSI_UNEXP_SELFTEST_MODE	52h	SCSI	Unexpected Self Test mode
SCSI_ABORT_BIT_SET	53h	SCSI	Unexpected ABORT bit set
SCSI_NON_DSM_PRIMITIVE	54h	SCSI	Unexpected DSM primitive

Message	VSCQ	Type	Definition
SCSI_CMD_REFS_EXHAUSTED	55h	SCSI	Exhausted all command references.
SCSI_UNKNOWN_INQ_PAGE	56h	SCSI	Unknown Inquiry page
SCSI_UNKNOWN_IID	57h	SCSI	Unknown initiator ID
SCSI_UNKNOWN_SENSE_TYPE	58h	SCSI	Unknown sense type
SCSI_DMA_FIFO_ERR	59h	SCSI	DMA OVERRUN/UNDERRUN
SCSI_DMA_OFFSET_ERR	5Ah	SCSI	DMA offset error.
SCSI_DMA_PARITY_ERR	5Bh	SCSI	DMA parity error
SCSI_READ_PARITY_ERR	5Ch	SCSI	Read parity error
SCSI_OFFSET_ERR	5Dh	SCSI	SCSI offset error
SCSI_UNKNOWN_MODE_PAGE	5Eh	SCSI	Unknown Mode page
SCSI_EJECT_FAILED	5Fh	SCSI	EJECT failed
SCSI_ILLEGAL_MSG_SEQ	60h	SCSI	Illegal SCSI bus message sequence
SCSI_ILLEGAL_DSM_CMD	61h	SCSI	Illegal command returned from DSM.
SCSI_BUSY_STATUS_FAILED	62h	SCSI	Command should have return busy status
SCSI_UNEXP_CMD_REF	63h	SCSI	Unexpected Command reference found
SCSI_ILLEGAL_MON_CMD	64h	SCSI	Illegal command returned from MON Task
SCSI_DSM_TIMEOUT	65h	SCSI	DSM timeout.
SCSI_KERNEL_MSG_TIMEOUT	66h	SCSI	Receiving kernel message timeout
SCSI_FW_DOWNLOAD_FAILED	67h	SCSI	Microcode download failure
SCSI_UNKN_CMD_REF_TYPE	68h	SCSI	Unknown Command Reference Type
SCSI_RB_NO_ROOM	69h	SCSI	Ring Buffer should have enough room
SCSI_MAIN_NOT_FOUND	6Ah	SCSI	pMainRoutine not found
SCSI_XFERDONE_NOT_FOUND	6Bh	SCSI	pXferDoneRoutine not found
SCSI_COMPDONE_NOT_FOUND	6Ch	SCSI	pCompDoneRoutine not found
SCSI_PDETECT_NOT_FOUND	6Dh	SCSI	pDetect routine not found
SCSI_PCMD_LOSTINFEHEAD	6Eh	SCSI	pCmd lost in the FE head
SCSI_PCMD_LOSTINBEHEAD	6Fh	SCSI	pCmd lost in the BE head
SCSI_PACTIVE_CMD_LOST	70h	SCSI	pActive_Cmd lost
SCSI_CR_POOL_UNINIT	71h	SCSI	Command Reference Pool sc_Command uninitialized
SCSI_QE_POOL_UNINIT	72h	SCSI	Queue Element Pool sc_Queue_Element uninitialized
SCSI_FAIL_TO_GET_FREE_ELEMENT	73h	SCSI	Fail to get free element from queue
SCSI_FAIL_TO_FREE_ELEMENT	74h	SCSI	Fail to free element during dequeue
SCSI_RB_BUSY	75h	SCSI	RB busy
SCSI_INVALID_CDB_LENGTH	76h	SCSI	(CDB Length != 6) and (CDB_Length != 10)
SCSI_UA_POWER_ON_OCCURRED	77h	SCSI	UA power on occurred
SCSI_UA_SCSI_BUS_RESET_OCCURRED	78h	SCSI	UA SCSI bus reset occurred
SCSI_UA_BUS_DEVICE_RESET_FUNCTION_OCCURRED	79h	SCSI	UA bus device reset function occurred
SCSI_UA_INTERNAL_FW_REBOOT	7Ah	SCSI	UA internal FW reboot
SCSI_UA_TRANSCEIVERS_CHANGED_TO_SE	7Bh	SCSI	UA transceivers changed to se

Message	VSCQ	Type	Definition
SCSI_UA_TRANSCEIVERS_CHANGED_TO_LVD	7Ch	SCSI	UA transceivers changed to LVD
SCSI_UA_COMMANDS_CLEARED_BY_ANOTHER_I NITIATOR	7Dh	SCSI	
SCSI_FE_DISPATCH_NULL_POINTER	7Eh	SCSI	Fe dispatch null pointer
SCSI_BE_DISPATCH_NULL_POINTER	7Fh	SCSI	Be dispatch null pointer
DSM_ILLEGAL_CMD	80h	Data set manager	A command was sent to Data Set Manager Task that it did not recognize.
DSM_APPEND_LOCATE_FAILED	81h	Data set manager	Status not used.
DSM_MIC_COMMAND_FAILED	82h	Data set manager	Not used.
DSM_WR_FMK_TIMEOUT	83h	Data set manager	
DSM_COMMAND_MISMATCH	84h	Data set manager	Not used.
DSM_CMPR_READ_DP_ERROR	86h	Data set manager	Data Processing error during decompression.
DSM_CMPR_READ_INVALID_INTERRUPT	87h	Data set manager	Cause of Decompression Interrupt cannot be determined.
DSM_CMPR_UNRECOGNIZED_ALERT	88h	Data set manager	
DSM_CMPR_READ_C1_ERROR	89h	Data set manager	
DSM_BUSY	8Ah	Data set manager	
DSM_PORT_B_ADDR_RANGE	8Bh	Data set manager	
DSM_EOD_DETECTED	8Ch	Data set manager	
DSM_WR_ILLEGAL_RB_DESC	8Dh	Data set manager	
DSM_COMMAND_FAILED_MIC_CERR	8Eh	Data set manager	
DSM_COMMAND_FAILED_MIC_HERR	8Fh	Data set manager	
DSM_BUSY_GOT_REWIND	90h	Data set manager	
DSM_READ_STOP_NEEDS_READ	91h	Data set manager	
DSM_DRIVE_NOT_READY	92h	Data set manager	
DSM_UNKNOWN_COMMAND	93h	Data set manager	
DSM_CMPR_INTERRUPT_NO_DS	94h	Data set manager	
DSM_FORMAT_ERROR_DSN	95h	Data set manager	
DSM_FORMAT_ERROR_RECORD_COUNT	96h	Data set manager	
DSM_FORMAT_ERROR_FMK_COUNT	97h	Data set manager	
DSM_FORMAT_ERROR_TOTAL_RECORDS	98h	Data set manager	
DSM_FORMAT_ERROR_TOTAL_FMKS	99h	Data set manager	
DSM_FORMAT_ERROR_THREAD_COUNT	9Ah	Data set manager	
DSM_FORMAT_ERROR_THREAD_WRITE_PASS	9Bh	Data set manager	
DSM_FORMAT_ERROR_TAPE_WRITE_PASS	9Ch	Data set manager	
DSM_FORMAT_ERROR_EXPECTED_FID	9Dh	Data set manager	
DSM_FORMAT_ERROR_UNKNOWN_DS_TYPE	9Eh	Data set manager	
DSM_MISSING_DS_READ_STOP	9Fh	Data set manager	
DSM_MISSING_DS_REWIND	A0h	Data set manager	
DSM_MISSING_DS_DS_FLUSH	A1h	Data set manager	
DSM_FREEPOOL_NEG_COUNT_IN_FEED_ELDC	A2h	Data set manager	
DSM_FREEPOOL_SENT_NULL_DS_IN_FEED_ELD C	A3h	Data set manager	
DSM_FREEPOOL_SENT_NULL_DS_IN_FEED_ELD C2	A4h	Data set manager	
DSM_CMPR_NEEDS_DS_RANGE_ERR	A5h	Data set manager	
DSM_CMPR_SKIP_IN_DS_FAILED	A6h	Data set manager	
DSM_MISSING_DS_LOCATE_READ_STOP	A7h	Data set manager	

Message	VSCQ	Type	Definition
DSM_CMPR_READ_RETRY_LIMIT_EXCEEDED	A8h	Data set manager	
DSM_NO_SKIP_DS	A9h	Data set manager	
DSM_FORMAT_ERROR_AT_EOD	AAh	Data set manager	
DSM_FILEMARK_ENCOUNTERED	ABh	Data set manager	
DSM_READ_PAUSE_NEEDS_READ	ACh	Data set manager	
DSM_SPACE_REV_BLKS_BOT_ENCOUNTERED	ADh	Data set manager	
DSM_NO_WRITE_APPEND_DS	AEh	Data set manager	
DSM_CMPR_WR_NO_ACCESS_PT_IN_APPEND_DS	AFh	Data set manager	
DSM_WRITE_FLUSH_ERROR	B0h	Data set manager	
DSM_WRITE_ERROR	B1h	Data set manager	
DSM_NULL_DS_DETECTED_DURING_FLUSH	B2h	Data set manager	
DSM_CANT_FLUSH_COMPRESSOR_NOT_HALTED	B3h	Data set manager	
DSM_NOT_IN_WRITE_MODE_CANT_FLUSH	B4h	Data set manager	
DSM_BE_PENDED_FLUSH_CMD_LOST	B5h	Data set manager	
DSM_ELDC_SET_NDSPTR_NULL	B6h	Data set manager	
DSM_LOCATE_NEEDS_IDLE	B7h	Data set manager	
DSM_GENERAL_COMPRESSION_ERROR	B8h	Data set manager	
DSM_POSITION_MISMATCH_AFTER_FLUSH	B9h	Data set manager	
DSM_MISSING_DS_RETURN_TO_FREEPOOL	BAh	Data set manager	
DSM_ELDC_DS_COUNT_MISMATCH	BBh	Data set manager	
DSM_ELDC_DS_COUNT_IS_NEGATIVE	BCh	Data set manager	
DSM_MISSING_DS_FLUSH_DONE	BDh	Data set manager	
DSM_SPACE_REV_FMKS_BOT_ENCOUNTERED	BEh	Data set manager	
DSM_CMPR_SET_MAXSIZE_BUSY	BFh	Data set manager	
TAPE_ILLEGAL_CMD	C0h	TAPE	
TAPE_SRV_ILLEGAL_CMD	C1h	TAPE	Illegal cmd opt code
TAPE_SRV_CMD_TIMEOUT	C2h	TAPE	WP idle but not pick up cmd until time-out
TAPE_SRV_OVERLAPPED_CMD	C3h	TAPE	Low level is currently busy with another cmd
TAPE_SRV_WP_BUSY	C4h	TAPE	unable deposit cmd since WP busy until time-out
TAPE_RECYCLE	C5h	TAPE	Data Set status: recycle Data Set.
TAPE_DS_NOT_WRITTEN	C6h	TAPE	Data Set status: not written Data Set.
TAPE_NOT_READY	C7h	TAPE	Whirlpool_status Ready bit is not set.
TAPE_WRITE_PROTECT	C8h	TAPE	Write: Write protect tape.
TAPE_ILLEGAL_MODE	C9h	TAPE	Command received in illegal mode.
TAPE_EOT_STATUS	CAh	TAPE	Write: End of tape detected.
TAPE_WRITE_HARD_ERR	CBh	TAPE	Write: Hard write error detected.
TAPE_INVALID_STATE	CCh	TAPE	Invalid state.
TAPE_WRITE_UNEXP_MSG	CDh	TAPE	Write: unexpected message received.
TAPE_WRITE_DS_MISMATCH	CEh	TAPE	Write: data set ptr not match
TAPE_SERVO_REC_FAIL	CFh	TAPE	Write: fail to recover from servo demark.
TAPE_APPEND_FAIL	D0h	TAPE	Write: fail to append because can not detect the last Data Set written.

Message	VSCQ	Type	Definition
TAPE_C1_ERR	D1h	TAPE	Write: C1 ECC error detected by formatter.
TAPE_WRITE_UNKNOWN_ERR	D2h	TAPE	Write: Unknown error.
TAPE_HARD_READ_ERROR	D3h	TAPE	Read: Hard Read Error.
TAPE_READ_EOT	D4h	TAPE	Read: End of Tape
TAPE_READ_AT_EOD	D5h	TAPE	Read: EOD encounter
TAPE_READ_FIFO_OVRRUN	D6h	TAPE	Read: FIFO Overrrun (HW error)
TAPE_TARGET_NOT_FOUND	D7h	TAPE	Seek: target not found error
TAPE_ILLEGAL_SRV_ALERT	D8h	TAPE	Task: illegal SERVO_ALERT message received.
TAPE_ILLEGAL_MSG_TYPE	D9h	TAPE	Task: illegal message type received.
TAPE_BUSY_STATUS	DAh	TAPE	Task: Busy.
TAPE_ILLEGAL_ABORT_CMD	DBh	TAPE	Task: illegal ABORT_COMMMAND received.
TAPE_DS_IN_OUT_SEQUENCE	DCh	TAPE	Write: Data Set in out of sequence.
TAPE_DS_DN_OUT_SEQUENCE	DDh	TAPE	Write: Data Set done out of sequence.
TAPE_READ_BLANK_TAPE	DEh	TAPE	Read: Blank Tape
TAPE_ILLEGAL_SPEED	DFh	TAPE	tp_set_vco(): illegal speed.
TAPE_VCO_LOCK_ERR	E0h	TAPE	tp_set_vco(): VCO_LOCK error.
TAPE_VCO_PHASE_ERR	E1h	TAPE	tp_set_vco(): VCO is not running in correct phase.
TAPE_RECYCLING_DATA_SETS	E2h	TAPE	Write: FLUSH/FLUSH_ERASE command is received when recycle is in process.
TAPE_CHAN_ILLEGAL_EQ_REG	E3h	TAPE	Not a valid equalizer register (>20 during read)
TAPE_CHAN_ILLEGAL_PA_REG	E4h	TAPE	Not a valid preamp register (> 53)
TAPE_DS_NOT_AVAILABLE	E5h	TAPE	Data Set not available
TAPE_UNEXP_SERVO_ALERT	E6h	TAPE	Write: Unexpected SERVO_ALERT Message is received.
TAPE_CHAN_SET_CALIB_ID_ERROR	E7h	TAPE	
TAPE_CHAN_SET_CALIB_MODE_ERROR	E8h	TAPE	
TAPE_CHAN_ILLEGAL_MODE	E9h	TAPE	
TAPE_SERVO_ERROR	EAh	TAPE	Seek: Unrecoverable Hard Servo Error
TAPE_CHAN_READ_CALIB_ID_ERROR	EBh	TAPE	
TAPE_CHAN_READ_CALIB_MODE_ERROR	ECh	TAPE	
TAPE_READ_END_OF_WRAP	EEh	TAPE	Read: RAW read end-of-wrap
TAPE_RAW_READ_UNDERRUN	EFh	TAPE	Read: RAW underrun error
TAPE_CHAN_EQ1_COMM_ERROR	F0h	TAPE	
TAPE_CHAN_EQ2_COMM_ERROR	F1h	TAPE	
TAPE_CHAN_EQ1_AND_EQ2_COMM_ERROR	F2h	TAPE	
TAPE_BAD_MIC_PAGE	F3h	TAPE	Task: Bad MIC page error
TAPE_UNEXP_MSG_REC	F4h	TAPE	Task: Unexpected Message Received
TAPE_SRV_RAMP_UP_TO_LP1	F5h	TAPE	Write: Append ramp up, Whirlpool report lp1 before return SERVO_CMD_DONE.

Message	VSCQ	Type	Definition
TAPE_SRV_RAMP_UP_TO_LP6	F6h	TAPE	Write: Append ramp up, Whirlpool report
TAPE_WRITE_LOOP_BACK_FAIL	F7h	TAPE	Write: WRITE_LOOP_BACK error detected.
TAPE_WRITE_ISB_SVO_FAIL	F8h	TAPE	Write: LOOP_BACK, LOOP_EXT, or VAST, servo fail reported when writing Data Set by ISB_SVO_FAIL.
TAPE_WRITE_DSS_SERVO_FAULT	F9h	TAPE	Write: LOOP_BACK, LOOP_EXT, or VAST, servo
TAPE_FIRST_DS_SERVO_REC_FAIL	FAh	TAPE	Write: Fail to handle the Servo de-mark when writing the first DSS/Data Set after fail reported when the first DSS/Data Set after
TAPE_UNEXP_SVA_LP1_UNDERRUN	FBh	TAPE	Write: unexpected lp1 received.
TAPE_UNEXP_SVA_LP6_OVERRUN	FCh	TAPE	Write: unexpected lp6 received.
TAPE_AUTO_LOAD_CM_FAILED	FDh	TAPE	CM failure during auto_load sequence
TAPE_READ_ILLEGAL_OLD_DATA	FEh	TAPE	Read: Reader detects old data which has higher WPC than new data WPC
TAPE_FIRST_DS_APPEND_FAIL	FFh	TAPE	Write: Fail to detect the last Data Set after enter write mode.
SRV_STATUS_100=0X100	100h	Servo	
SRV_CMD_REJECT	101h	Servo	Command rejected
SRV_CMD_ERROR	102h	Servo	Command error
SRV_CMD_ABORTED	103h	Servo	Command aborted
SRV_ALERT	104h	Servo	Servo Alert
SRV_REJ_INV_STATE	105h	Servo	Invalid State For This Command
SRV_REJ_CMD	106h	Servo	Unrecognized Command
SRV_REJ_PARM	107h	Servo	Invalid Parameter Received
SRV_REJ_FORMAT	108h	Servo	Invalid Message Format
SRV_REJ_NO_LP1	109h	Servo	LP1 Not Set
SRV_REJ_NO_CARTRIDGE	10Ah	Servo	No cartridge present
SRV_REJ_NOT_THREADED	10Bh	Servo	Cartridge not threaded yet
SRV_REJ_AT_BOT	10Ch	Servo	Cmd rejected,position already at BOT.
SRV_REJ_REWINDING	10Dh	Servo	Cmd rejected,tape already rewinding
SRV_REJ_CLEANING	10Eh	Servo	Cleaning tape inserted, cleaning in progress.
SRV_LPOS_TABLE_FULL	10Fh	Servo	LPOS table is full.
SRV_UNKNOWN_REASON	110h	Servo	Unknown reason code in cmd response memory.
SRV_DIVIDER_ERROR	111h	Servo	Hardware divider detected a division error
SRV_DIVIDER_TIMEOUT	112h	Servo	FW timed out waiting for hardware divider
SRV_SERVO_TIMEOUT	113h	Servo	Servo firmware time out
SRV_FIND_INDEX_FAILED	114h	Servo	Find drive motor index failed
SRV_CAL_SLOT_FAILED	115h	Servo	Calibrate slot command failed
SRV_GOTO_POINT_INVALID	116h	Servo	target point to close to ramp to or already past
SRV_SERVO_POWEROFF_FAILED	117h	Servo	servo did not acknowledge power

Message	VSCQ	Type	Definition
			off
SRV_REWIND_NOT_NECESSARY	118h	Servo	current tape position is at or before wrap point
SRV_NOT_USED_8	119h	Servo	
SRV_DIVIDER_OVERFLOW	11Ah	Servo	division overflow when using hardware divider.
SRV_MULTIPLY_ERROR	11Bh	Servo	overflow error in scaled int multiply routine.
SRV_WRONG_REEL_SELECT	11Ch	Servo	Wrong reel selected in rotate reel or stop reel command.
SRV_CMDPROC_UNDEFINED_SCRAMBLER_COMMAND	11Dh	Servo	Command sent from scrambler is not defined.
SRV_INVALID_MONITOR_MSG	11Eh	Servo	internal RTOS message unknown.
SRV_SELF_MONITOR_BUF_OVERFLOW	11Fh	Servo	fiq monitor to irq buffer overflow.
SRV_SELF_EVENT_BUF_OVERFLOW	120h	Servo	fiq event to irq buffer overflow.
SRV_RTOS_UNKNOWN	121h	Servo	unknown rtos error.
SRV_SEQ_TABLE_LOOKUP	122h	Servo	sequencer table look up error.
SRV_SEQ_NULL_FUNCTION_CALLED	123h	Servo	sequencer table function is null.
SRV_SEQ_UNEXPECTED_MESSAGE_RESPONSE	124h	Servo	response not expected for command.
SRV_SELF_ERROR_BUF_OVERFLOW	125h	Servo	fiq error buf to irq buffer overflow.
SRV_SEQ_NON_MECHANICAL_SCRAMBLER_COMMAND	126h	Servo	non mechanical command received by sequencer.
SRV_SEQ_OUT_OF_RANGE_SCRAMBLER_COMMAND	127h	Servo	out of range command received by sequencer.
SRV_SELF_RTOS_BUF_OVERFLOW	128h	Servo	fiq rtos buffer to irq buffer overflow.
SRV_CMDPROC_UNDEFINED_TASK_FOR_COMMAND_IN_BYPASS_MODE	129h	Servo	undefined task specified.
SRV_CMDTYPE_TABLE_INTEGRITY	12Ah	Servo	table integrity for command type or parameter table look up not consistent with command enumerated.
SRV_REEL_NO_TASK_SPECIFIED	12Bh	Servo	reel task received a message without a valid sender specified.
SRV_STACK_OVERFLOW	12Ch	Servo	stack overflow.
SRV_NO_SINECAL_DATA	12Dh	Servo	Sine calibration failed to find 0-xings.
SRV_BAD_SINECAL_DATA	12Eh	Servo	Sine calibration found invalid 0-xings.
SRV_NO_SINECAL_INDEX	12Fh	Servo	Sine calibration couldn't find index.
SRV_NO_LOADRCA_INDEX	130h	Servo	Sine RCA/RCB load couldn't find index.
SRV_PARAM_TABLE_INTEGRITY	131h	Servo	Table lookup not consistent with COMMAND_ENUM definitions.
SRV_PARPORT_SCRAMBLER_NOT_READY_IN_SEND_RESPONSE	132h	Servo	Scrambler not ready to accept command.
SRV_PARPORT_UNDEFINED_CONDENSED_FORMAT	133h	Servo	Undefined scrambler condensed format.
SRV_CMDPROC_NO_TAPE_TO_EJECT	134h	Servo	Eject attempt rejected because there was no tape.
SRV_CMDPROC_REJECT_EJECT_INVALID_STATE	135h	Servo	Reject eject button due to invalid mechanical state.
SRV_PARPORT_SCRAMBLER_NOT_READY_IN_PASS_THRU	136h	Servo	Scrambler not ready to accept command for passthru mode.

Message	VSCQ	Type	Definition
SRV_MOVETAPE_REVERSE_PHYSICAL_LIMIT_UNDERRUN_DURING_CRUISE_CONTROL	137h	Servo	Physical limit exceeded in reverse direction.
SRV_CMDPROC_SET_TAPE_SPEED_REJ_INVALID_STATE	138h	Servo	Reject set tape speed command
SRV_CMDPROC_SET_TAPE_SPEED_REJ_NOT_INCREASING	139h	Servo	Reject set tape speed command
SRV_MOVETAPE_FORWARD_PHYSICAL_LIMIT_OVERRUN_DURING_RAMP_UP	13Ah	Servo	Physical limit in forward direction exceeded in ramp up state.
SRV_MOVETAPE_ERROR_EOT_OVERRUN_DURING_CRUISE_CONTROL	13Bh	Servo	Tape has gone past eot during cruise control state
SRV_MOVETAPE_ERROR_BOT_UNDERRUN_DURING_CRUISE_CONTROL	13Ch	Servo	Tape has gone past bot during cruise control state or emergency shut down.
SRV_MOVETAPE_ERROR_EOT_OVERRUN_DURING_RAMP_UP	13Dh	Servo	Tape has gone past eot during ramp up state
SRV_MOVETAPE_ERROR_BOT_UNDERRUN_DURING_RAMP_UP	13Eh	Servo	Tape has gone past bot during ramp up state
SRV_INVALID_MARK_SELECT	13Fh	Servo	Invalid mode select in mark.c.
ECC_C2_ERROR	140h	ECC	
MIC_NO_STATUS	180h	Medium Auxiliary Memory	Fill Info.Word with this if there is no status to send.
MIC_PAGE_ID_BAD	181h	Medium Auxiliary Memory	the PAGE ID value received is out of RANGE.
MIC_PAGE_DOES_NOT_EXIST	182h	Medium Auxiliary Memory	the PAGE ID requested does not exist in the PAGE descriptor table.
MIC_PAGE_CRC_BAD	183h	Medium Auxiliary Memory	the CRC calculated on the PAGE is not valid.
MIC_PAGE_LOCKED_60SEC	184h	Medium Auxiliary Memory	a lock is on the PAGE for more than 60 seconds.
MIC_RELOCKING_PAGE_ERR	185h	Medium Auxiliary Memory	a Task is trying to lock a PAGE that it has already locked.
MIC_BAD_STATUS_REQUEST	186h	Medium Auxiliary Memory	the status word requested was out of RANGE.
MIC_UNLOCKING_TWICE	187h	Medium Auxiliary Memory	a Task is trying to unlock a PAGE that is not locked.
MIC_TAPE_DIR_RANGE	188h	Medium Auxiliary Memory	the Tape Directory index value given is out of range or too big.
MIC_INVALID_MSG_TYPE	189h	Medium Auxiliary Memory	an illegal message type was sent to the MIC Task.
MIC_INVALID_TASK_VALUE	18Ah	Medium Auxiliary Memory	the Task number in the message received was out of range.
MIC_RESET_MSG_BAD	18Bh	Medium Auxiliary Memory	there was an error in the RESET message sent to the MIC Task.
MIC_PAGE_WR_PROT	18Ch	Medium Auxiliary Memory	the PAGE is write protected and a read modify lock is requested.
MIC_CART_NOT_SEATED	18Dh	Medium Auxiliary Memory	the Cartridge was not seated when a request for a lock was received.
MIC_FLUSHING_RAM	18Eh	Medium Auxiliary Memory	the RAM is being flushed to EEPROM and read modify locks are not allowed.
MIC_WRITE_PASS_INVALID	18Fh	Medium Auxiliary Memory	the write pass value stored in the EEPROM is not correctly stored.
MIC_DELAYED_Q_FULL	190h	Medium Auxiliary Memory	there is no more room on the delayed Q when a message needs to be delayed.

Message	VSCQ	Type	Definition
MIC_CREATE_TWICE	191h	Medium Auxiliary Memory	create_lock message received on a Page that is already created.
MIC_SPI_FAILED	192h	Medium Auxiliary Memory	Serial Port Interface failed
MIC_READ_FAILED	193h	Medium Auxiliary Memory	Read CM/EEPROM failed
MIC_WRITE_FAILED	194h	Medium Auxiliary Memory	Write CM/EEPROM failed
MIC_VERIFY_FAILED	195h	Medium Auxiliary Memory	Read after Write failed
MIC_BAD_PG_TBL	196h	Medium Auxiliary Memory	Page table corrupted
MIC_BAD_PG_ID	197h	Medium Auxiliary Memory	Page ID incorrect
MIC_BAD_PG_LEN	198h	Medium Auxiliary Memory	Page length incorrect
MIC_INVALID_COPIES	199h	Medium Auxiliary Memory	Too many/little copies of a page
MIC_MALT_INIT_FAILED	1A0h	Medium Auxiliary Memory	Cannot init MALT reader chip
MIC_CM_NOT_DETECTED	1A1h	Medium Auxiliary Memory	Cannot find Cartridge Memory chip
MIC_BAD_CM_INFO	1A2h	Medium Auxiliary Memory	CM Manufacturer Info is blank/invalid
MIC_NO_CART_INFO	1A3h	Medium Auxiliary Memory	Cart Manufacturer Info does not exist
MIC_BAD_CART_INFO	1A4h	Medium Auxiliary Memory	Cart Manufacturer Info is blank/invalid
MIC_NO_MEDIA_INFO	1A5h	Medium Auxiliary Memory	Media Manufacturer Info does not exist
MIC_BAD_MEDIA_INFO	1A6h	Medium Auxiliary Memory	Media Manufacturer Info is blank/invalid
MIC_NO_INIT_DATA	1A7h	Medium Auxiliary Memory	Initialisation Data does not exist
MIC_PARTIAL_INIT	1A8h	Medium Auxiliary Memory	data CM is partially init or corrupted
Tape shall send CM_INIT_PG & init some pages			
MIC_CLEAN_CART_BAD	1A9h	Medium Auxiliary Memory	clean CM is partially init or corrupted
SCSI shall report error, blink led, eject cart			
MIC_CLEAN_CART_NEW	1AAh	Medium Auxiliary Memory	clean cart is uninit but support Seagate
Tape shall send CM_INIT_PG & init some pages			
MIC_CLEAN_CART_OTHER	1ABh	Medium Auxiliary Memory	clean cart was init by other drive
SCSI shall report error, blink led, eject cart			
MIC_CLEAN_CART_SEAGATE	1ACh	Medium Auxiliary Memory	clean cart was init by Seagate drive
Tape shall clean head, update cm, eject cart			
MIC_CLEAN_CART_INCOMPAT	1ADh	Medium Auxiliary Memory	clean cart does not support Seagate
SCSI shall report error, blink led, eject cart			

Message	VSCQ	Type	Definition
MIC_CART_TYPE_INVALID	1AEh	Medium Auxiliary Memory	cart type is not data or cleaning
MIC_WRITE_PASS_INVLD2	1Afh	Medium Auxiliary Memory	2nd type of invalid write pass
MIC_CLEAN_CART_NEW_UCC	1B0h	Medium Auxiliary Memory	Clean cart is uninit universal clean cart. Tape shall send CM_INIT_PG and init some pages
MIC_CLEAN_CART_UCC	1B1h	Medium Auxiliary Memory	Universal clean cart was initialized. Tape shall clean head, update cm, eject cart
SCSI shall report error, blink led, eject cart			
CALIB_BUSY_STATUS	1C0h	Calibration	
MON_CMD_OVERLAPPED	200h	Monitor	Cmd overlapped
MON_CMD_INVALID_CHECK_SUM	201h	Monitor	Check sum failed
MON_CMD_INVALID_OPT_CODE	202h	Monitor	Invalid Opt code
MON_CMD_ILLEGAL_ABORTED	203h	Monitor	Illegal abort
MON_CMD_ILLEGAL_IMM_BIT	204h	Monitor	IMM bit not allowed
MON_CMD_IN_PROG	205h	Monitor	Cmd is not finished yet
MON_BTO_INT_TEST_FAILED	206h	Monitor	Bus time-out INT test failed
MON_C1CMPL_INT_TEST_FAILED	207h	Monitor	C1 INT test failed
MON_WCQ_INT_TEST_FAILED	208h	Monitor	WCQ INT test failed
MON_SCSI_EXT_INT_TEST_FAILED	209h	Monitor	SCSI EXT INT test failed
MON_HOST_DMA_INT_TEST_FAILED	20Ah	Monitor	Host DMA INT test failed
MON_DSS_INT_TEST_FAILED	20Bh	Monitor	DSS INT test failed
MON_RBT_INT_TEST_FAILED	20Ch	Monitor	RB threshold INT test failed
MON_DP_INT_TEST_FAILED	20Dh	Monitor	ELDC INT test failed
MON_TMR1_INT_TEST_FAILED	20Eh	Monitor	Timer 1 INT test failed
MON_SRVO_INT_TEST_FAILED	20Fh	Monitor	Servo INT test failed
MON_DS_INT_TEST_FAILED	210h	Monitor	DS INT test failed
MON_ECC_INT_TEST_FAILED	211h	Monitor	ECC INT test failed
MON_TMR2_INT_TEST_FAILED	212h	Monitor	Timer 2 INT test failed
MON_INT_TEST_FAILED	213h	Monitor	INT test failed (general)
MON_TIMER_TEST_FAILED	214h	Monitor	timer test failed
MON_TIMER_PRESCALE_TEST_FAILED	215h	Monitor	timer prescale test failed
MON_PATTERNIZE_DATA_FAILED	216h	Monitor	patternize data patterns failed
MON_PASSTHRU_INT_FAILED	217h	Monitor	Pass-thru INT failed
MON_PASSTHRU_FAILED	218h	Monitor	Pass-thru Operation failed
MON_PASSTHRU_MISCOMPARE	219h	Monitor	Pass-thru Miscompare failed
MON_DC_FAILED	21Ah	Monitor	DC Operation failed
MON_DC_MISCOMPARE	21Bh	Monitor	DC data miscompare
MON_ADAPTEC_SCSI_CONTROLLER_FAILED	21Ch	Monitor	SCSI controller selftest failed
MON_INTERNAL_SRAM_SCSI_CONTROLLER_FAILED	21Dh	Monitor	SCSI controller internal
MON_TEST_MEM_FAILED	21Eh	Monitor	SRAM selftest failed
MON_CHECK_SUM_TEST_FAILED	21Fh	Monitor	
MON_NO_DS_AVAILABLE	220h	Monitor	No Data Set is available at time of request
MON_CMD_ILLEGAL_PARAMETER	221h	Monitor	Illegal parameter
MON_RX1_INT_TEST_FAILED	222h	Monitor	Serial port 1 rcv interrupt test failed
MON_TX1_INT_TEST_FAILED	223h	Monitor	Serial transmit intr test failed

Message	VSCQ	Type	Definition
MON_RX2_INT_TEST_FAILED	224h	Monitor	Timer 1 intr test failed
MON_TIMER1_INT_TEST_FAILED	225h	Monitor	Serial port 2 rcv intr test failed
MON_TX2_INT_TEST_FAILED	226h	Monitor	Serial port 2 transmit intr test failed
MON_RTC_INT_TEST_FAILED	227h	Monitor	Real time clock intr test failed
MON_SC_EXTERNAL_SRAM_TEST_FAILED	228h	Monitor	Scrambler External SRAM test failed
MON_SC_INTERNAL_SRAM_TEST_FAILED	229h	Monitor	Scrambler Internal SRAM test failed
MON_SC_SDRAM_TEST_FAILED	22Ah	Monitor	Scrambler Data Set SDRAM test failed
MON_WP_INTERNAL_SRAM_TEST_FAILED	22Bh	Monitor	Servo Internal RAM test failed
MON_WP_EXTERNAL_SRAM_TEST_FAILED	22Ch	Monitor	Servo External RAM test failed
MON_DS_INTERNAL_SRAM_TEST_FAILED	22Dh	Monitor	Data Set Internal SRAM test failed
MON_NEXT_STEP_READY	22Eh	Monitor	Command ready for next step, waiting for no response
MON_COMPRESSION_SCHEME_1_FAILED	22Fh	Monitor	Compression Scheme 1 failure
MON_COMPRESSION_SCHEME_2_FAILED	230h	Monitor	Compression Scheme 2 failure
MON_COMPRESSION_AUTO_SCHEME_FAILED	231h	Monitor	Auto Scheme Compression failure
MON_DECOMPRESSION_SCHEME_1_FAILED	232h	Monitor	Decompression Scheme 1 failure
MON_DECOMPRESSION_SCHEME_2_FAILED	233h	Monitor	Decompression Scheme 2 failure
MON_DECOMPRESSION_AUTO_SCHEME_FAILED	234h	Monitor	Auto Scheme Decompression failure
MON_DESC_ERRORS	235h	Monitor	Despcriptor Errors detected
MON_CRC_ERROR	236h	Monitor	CRC checking error
MON_INVALID_PARAMETERS	237h	Monitor	Invalid parameters field in cmd packet
MON_NO_CARTRIDGE_INSERTED	238h	Monitor	No Cartridge inserted
MON_SERVO_MARGIN_DATA_IS_NOT_AVAILABLE	239h	Monitor	
SRV_LPOS_NOTIFICATION_NOT_FOUND	240h	Servo	Delete lpos failed because it was not in the notify table.
SRV_LPOS_UNRECOGNIZED_LPOS_DELETE_MODE	241h	Servo	Delete mode not recognized as a valid enum.
SRV_LPOS_READ_DIR_INVALID	242h	Servo	Invalid direction in lpos notification check
SRV_MOVETAPE_REVERSE_PHYSICAL_LIMIT_UNDERRUN_DURING_RAMP_UP	243h	Servo	Physical limit in reverse direction exceeded in ramp up state.
SRV_MOVETAPE_RAMP_DOWN_FAILED_AT_LPOS_NOTIFICATION	244h	Servo	A ramp down attempt was rejected by the fiq servo code during the cruise control state when the tape was already at the lpos location.
SRV_MOVETAPE_RAMP_DOWN_FAILED_WHEN_REVERSING_DIR	245h	Servo	A ramp down attempt was rejected by the fiq servo code during the cruise control state when the tape required a reverse of direction.
SRV_MOVETAPE_RAMP_DOWN_FAILED_WHEN_SPEED_CHANGE_REQUIRED	246h	Servo	A ramp down attempt was rejected by the fiq servo code during the cruise control state when a speed change was required.
SRV_MOVETAPE_TAPE_ACTIVE_CMD_NOT_VALID_FOR_THIS_STATE	247h	Servo	In tape state machine - active command not valid for this state.
SRV_MOVETAPE_TAPE_RAMP_UP_FAILED_FROM_IDLE_STATE	248h	Servo	Ramp up failed in srv_skip_to_lpos_in_idle transition function.
SRV_MOVETAPE_UNEXPECTED_MESSAGE_RES	249h	Servo	An unexpected message was re-

Message	VSCQ	Type	Definition
PONSE_IN_CRUISE_CONTROL			ceived in the cruise control.
SRV_LPOS_REJECT_LPOS_SET_LPOS_NOTIFICA TION_BECAUSE_TABLE_IN_USE	24Ah	Servo	Notification table being updated by other task - access denied.
SRV_MOVETAPE_RAMPDOWN_FAILED_DURING_ LPOS_UNDERRUN_IN_CRUISE_CONTROL	24Bh	Servo	Tape lpos underrun error during cruise control state.
SRV_MOVETAPE_RAMPDOWN_FAILED_DURING_ LPOS_OVERRUN_IN_CRUISE_CONTROL	24Ch	Servo	Tape lpos overrun error during cruise control state.
SRV_MOVETAPE_FORWARD_PHYSICAL_LIMIT_O VERRUN_DURING_CRUISE_CONTROL	24Dh	Servo	Physical limit exceeded in forward direction.
SRV_SEQ_TABLE_LOOKUP_ERROR	24Eh	Servo	Sequencer table incorrectly defined at compile time.
SRV_SEQ_MAXIMUM_STATE_EXCEEDED	24Fh	Servo	Sequencer index exceeded maximum number of functions in table.
SRV_REEL_MAXIMUM_STATE_EXCEEDED	250h	Servo	Reel task state variable exceeded number of defined states.
SRV_CMDPROC_NOT_ENOUGH_TAPE_TO_RAMP	251h	Servo	Not enough tape is available to ramp up before a PBOT or PEOT condition ramps down.
SRV_CMDPROC_PAST_LP1_REJ_INV_STATE	252h	Servo	Command rejected since we are already past lp1.
SRV_CMDPROC_PAST_LP6_REJ_INV_STATE	253h	Servo	Command rejected since we are already past lp6.
SRV_CMDPROC_REJ_NO_LP1	254h	Servo	Command rejected since tape parameters were not set.
SRV_CMDPROC_REJ_PARM	255h	Servo	Command rejected in command processor because of invalid parameter value.
SRV_CMDPROC_REJ_INV_DIR	256h	Servo	Command rejected
SRV_CMDPROC_REJ_CMD_NOT_ENOUGH_TAPE_ TO_RAMP	257h	Servo	Command rejected - not enough tape to ramp before lpos.
SRV_CMDPROC_REJ_CMD_TAPE_PAST_TARGET _LPOS	258h	Servo	Command rejected - tape past target lpos already.
SRV_CMDPROC_TAPE_NOT_STOPPED	259h	Servo	Command rejected - tape in motion.
SRV_REEL_UNKNOWN_TAPE_MOVE_COMMAND	25Ah	Servo	Reel task recieved a command not recognized as a tape movement command
SRV_MOVETAPE_RAMPDOWNTAPE_API_BUSY_R EJECT	25Bh	Servo	Servo API function RampDown-Tape() returned busy status.
SRV_MOVETAPE_MOVETAPETRACK_API_BUSY_ REJECT	25Ch	Servo	Servo API function MoveTape-Track() returned busy status.
SRV_MOVETAPE_MOVETAPE_API_BUSY_REJECT	25Dh	Servo	Servo API function MoveTape() returned busy status.
SRV_REEL_INVALID_MESSAGE_RECEIVED	25Eh	Servo	An invalid message was recieved by the reel task.
SRV_REEL_DRIVEMOTOR_ON_API_BUSY_REJEC T	25Fh	Servo	API call DriverMotor failed.
SRV_REEL_DRIVEMOTOR_OFF_API_BUSY_REJE CT	260h	Servo	API call DriverMotor failed.
SRV_REEL_MOTORPOWEROFF_API_BUSY_REJE CT	261h	Servo	API call MotorPowerOff failed.
SRV_REEL_TIMEOUT_USER_ABORT_STATE	262h	Servo	Timeout message recieved in USER_ABORT_STATE.
SRV_REEL_TIMEOUT_USER_ABORT_TAPE_STAT E	263h	Servo	Timeout message recieved in USER_ABORT_TAPE_STATE.

Message	VSCQ	Type	Definition
SRV_MOVETAPE_TIMEOUT_RAMP_UP_STATE	264h	Servo	Timeout message recieved in RAMP_UP_STATE.
SRV_MOVETAPE_TIMEOUT_RAMP_DOWN_STATE	265h	Servo	Timeout message recieved in RAMP_DOWN_STATE.
SRV_MOVETAPE_TIMEOUT_RAMP_DOWN_RESTART_STATE	266h	Servo	Timeout message recieved in RAMP_DOWN_RESTART_STATE.
SRV_ROTATE_RAMPUPDRIVEMOTOR_API_DRIVE_REEL_REJECT_BUSY	267h	Servo	API call RampUpDriveMotor failed.
SRV_ROTATE_RAMPUPDRIVEMOTOR_API_CART_REEL_REJECT_BUSY	268h	Servo	API call RampUpDriveMotor failed
SRV_ROTATE_INVALID_REEL_SELECT_RAMP_UP	269h	Servo	Invalid reel select parameter.
SRV_ROTATE_RAMPDOWNDRIVEMOTOR_DRIVE_SEL_API_REJECT_BUSY	26Ah	Servo	API call RampDownDriveMotor failed.
SRV_ROTATE_RAMPDOWNDRIVEMOTOR_CART_SEL_API_REJECT_BUSY	26Bh	Servo	API call RampDownDriveMotor failed.
SRV_ROTATE_INVALID_REEL_SELECT_RAMP_DOWN	26Ch	Servo	Invalid reel select parameter.
SRV_ROTATE_INVALID_REEL_SELECT_RAMP_UP_REEL_STATE	26Dh	Servo	Invalid reel select parameter in ramp up reel select.
SRV_ROTATE_TIMEOUT_RAMP_UP_REEL_STATE	26Eh	Servo	Timeout message occurred during ramp up reel state.
SRV_ROTATE_INVALID_REEL_SELECT_ROTATING_REEL_STATE	26Fh	Servo	Invalid reel select parameter in rotating reel state.
SRV_ROTATE_TIMEOUT_RAMP_DOWN_REEL_STATE	270h	Servo	Timeout message received in ramp down reel in rotate.
SRV_POSREEL_POSITIONDRIVE_API_REJECT_BUSY_IN_MOVE_HOME	271h	Servo	API call PositionDrive failed.
SRV_POSREEL_POSITIONDRIVE_API_REJECT_BUSY_IN_POSITION_MOVE	272h	Servo	API call PositionDrive failed.
SRV_POSREEL_HOMEDRIVEREEL_API_REJECT_BUSY	273h	Servo	API call HomeDriveReel failed.
SRV_POSREEL_TIMEOUT_IN_MOVE_TO_POSITION_STATE	274h	Servo	Timeout message received in move to position state.
SRV_GOTO_LC_POSITIONTAPE_API_BUSY_REJECT	275h	Servo	API call PositionTape failed.
SRV_GOTO_LC_TIMEOUT_IN_RAMP_UP_STATE	276h	Servo	Timeout message received in RAMP_UP_STATE.
SRV_GOTO_LC_TIMEOUT_IN_WAIT_MARK_STATE	277h	Servo	Timeout message received in WAIT_MARK_STATE.
SRV_GOTO_LC_TIMEOUT_IN_MARK_FOUND_STATE	278h	Servo	Timeout message received in MARK_FOUND_STATE.
SRV_GOTO_LC_TIMEOUT_IN_POSITION_STATE	279h	Servo	Timeout message received in POSITION_REEL_STATE.
SRV_CMDPROC_REJ_PARM_LPOS_NOT_WITHIN_LP2_OR_LP6_IN_SKIP_TO_LPOS_VALID	27Ah	Servo	Command rejected in skip to lpos.
SRV_CMDPROC_REJ_PARM_LP1_OR_LP6_OUT_OF_RANGE	27Bh	Servo	SET_TAPE command rejected because LP1 or LP6 out of range.
SRV_CMDPROC_REJ_CMD_TAPE_IN_MOTION_IN_SETTAPE_CMD	27Ch	Servo	SET TAPE command rejected because tape was in motion.
SRV_CMDPROC_WRITELINEARCOUNTER_API_REJECT_BUSY	27Dh	Servo	API call WriteLinearCounter failed.
SRV_CMDPROC_SETRADIUSCOUNTER_API_REJ_CMD_REJECT_BUSY	27Eh	Servo	API call SetRadiusCounter failed.
SRV_CMDPROC_SETTENSION_API_REJECT_BUS	27Fh	Servo	API call SetTension failed.

Message	VSCQ	Type	Definition
Y_IN_SET_PARAMETER			
SCSI_STATUS_DIAG_INIT_FAILED	280h	SCSI	
SCSI_STATUS_DIAG_SBIST_FAILED	281h	SCSI	
SCSI_STATUS_DIAG_BBIST_FAILED	282h	SCSI	
SCSI_STATUS_DIAG_DBIST_FAILED	283h	SCSI	
SCSI_STATUS_DIAG_DMA_SETUP_FAILED	284h	SCSI	
SCSI_STATUS_DIAG_HI_RAM_FAILED	285h	SCSI	
SCSI_STATUS_DIAG_AIC_RAM_FAILED	286h	SCSI	
SCSI_STATUS_DIAG_DMA_WRITE_INTERRUPT_FAILED	287h	SCSI	
SCSI_STATUS_DIAG_DMA_WRITE_DFIFOERR	288h	SCSI	
SCSI_STATUS_DIAG_DMA_WRITE_OFSERR	289h	SCSI	
SCSI_STATUS_DIAG_DMA_WRITE_DMAPERR	28Ah	SCSI	
SCSI_STATUS_DIAG_DMA_WRITE_RDPARERR	28Bh	SCSI	
SCSI_STATUS_DIAG_DMA_WRITE_MPACCERR	28Ch	SCSI	
SCSI_STATUS_DIAG_DMA_WRITE_COUNTER_ERROR	28Dh	SCSI	
SCSI_STATUS_DIAG_DMA_WRITE_DATA_COMPARE_ERROR	28Eh	SCSI	
SCSI_STATUS_DIAG_DMA_READ_INTERRUPT_FAILED	28Fh	SCSI	
SCSI_STATUS_DIAG_DMA_READ_DFIFOERR	290h	SCSI	
SCSI_STATUS_DIAG_DMA_READ_OFSERR	291h	SCSI	
SCSI_STATUS_DIAG_DMA_READ_DMAPERR	292h	SCSI	
SCSI_STATUS_DIAG_DMA_READ_RDPARERR	293h	SCSI	
SCSI_STATUS_DIAG_DMA_READ_MPACCERR	294h	SCSI	
SCSI_STATUS_DIAG_DMA_READ_COUNTER_ERROR	295h	SCSI	
SCSI_STATUS_DIAG_DMA_READ_DATA_COMPARE_ERROR	296h	SCSI	
SCSI_STATUS_DIAG_TASK_STATUS_UNKNOWN	297h	SCSI	
SCSI_STATUS_DIAG_CABLE_PROBLEMS	298h	SCSI	
SCSI_STATUS_DIAG_EXCESSIVE_RESET_CONDITIONS	299h	SCSI	
SCSI_CUR_DESC_NULL_POINTER	29Ah	SCSI	
SCSI_MPACCESS_NEVER_CLEARED	29Bh	SCSI	
SCSI_AIC_IN_RESET_MODE	29Ch	SCSI	
SCSI_FW_IMAGE_FIRST_WORD_ZERO	29Dh	SCSI	
SCSI_FW_IMAGE_CHECKSUM_BAD	29Eh	SCSI	
SCSI_WB_PARAM_DATA_MISMATCH_CDB_PAGE_ID	29Fh	SCSI	
SCSI_WB_PARAM_DATA_MISMATCH_CDB_PLL_PAGE_SIZE	2A0h	SCSI	
SCSI_WB_PARAM_DATA_MISMATCH_MIC_PAGE_ID	2A1h	SCSI	
SCSI_WB_PARAM_DATA_MISMATCH_MIC_PAGE_SIZE	2A2h	SCSI	
SCSI_MEDIUM_PRESENT	2A3h	SCSI	
SCSI_NULL_THREAD_TABLE_PTR	2A4h	SCSI	
SCSI_UNKNOWN_AUTOLOAD_MODE	2A5h	SCSI	
SCSI_UNKNOWN_DIAGNOSTIC_TYPE	2A6h	SCSI	

Message	VSCQ	Type	Definition
SCSI_NULL_TRACE_BUFFER_NEXT_PTR	2A7h	SCSI	
SCSI_EJECT_BIT_SET_BUT_ABORT_BIT_NOT_SET	2A8h	SCSI	
SCSI_NUM_IID_REGISTERED_NOT_GREATER_THAN_ZERO	2A9h	SCSI	
SCSI_REG_MASK_NOT_EQU_RES_MASK_BITWISE_OR_REG_MASK	2AAh	SCSI	
SCSI_NUM_IID_REGISTERED_NOT_EQU_BITS_SET_IN_REG_MASK	2ABh	SCSI	
SCSI_ILLEGAL_CDB_REQ_WHEN_INSERTED	2ACh	SCSI	
SCSI_ILLEGAL_CDB_REQ_WHEN_SEATED	2ADh	SCSI	
SCSI_UNKNOWN_MEDIUM_POSITION_STATE	2Aeh	SCSI	
SCSI_STATUS_INVALID_MIC_STATE	2Afh	SCSI	
SCSI_LIB_KERNEL_MSG_TIMEOUT	2B0h	SCSI	
SCSI_UNEXPECTED_NUMBER_OF_TRACE_BUFFERS	2B1h	SCSI	
SCSI_UNXPECTED_CASE_IN_SWITCH	2B2h	SCSI	
SCSI_FW_IMAGE_OEMCODE_MISMATCH	2B3h	SCSI	
SCSI_FW_IMAGE_INTERFACE_TYPE_MISMATCH	2B4h	SCSI	
SCSI_FIRMWARE_MEDIUM_PRESENT	2B5h	SCSI	
SCSI_UNEXPECTED_TAPE_ALERT_MRIE	2B6h	SCSI	
SCSI_RESLELECTION_BUT_MISSING_PCMD_IN_FE	2B7h	SCSI	
SCSI_HTEST_ERR	2B8h	SCSI	
SCSI_INVALID_MEDIUM_FOR_SET_CAPACITY	2B9h	SCSI	
SCSI_PCMD_LOST_IN_LIBRARY_INTERFACE_0	2BAh	SCSI	
SCSI_PCMD_LOST_IN_LIBRARY_INTERFACE_1	2BBh	SCSI	
SCSI_PCMD_LOST_IN_LIBRARY_INTERFACE_2	2BCh	SCSI	
SCSI_PCMD_LOST_IN_LIBRARY_INTERFACE_3	2BDh	SCSI	
SCSI_PCMD_LOST_IN_LIBRARY_INTERFACE_4	2BEh	SCSI	
FC_WRONG_SIGNAL_NODE	2BFh	Fibre channel	
FC_UNABLE_ALLOC_DTD	2C0h	Fibre channel	
SCSI_UNKNOWN_FC_MSG	2C1h	SCSI	
SCSI_XFERSTOP_NOT_FOUND	2C2h	SCSI	
SCSI_INFO_STRUCTS_EXHAUSTED	2C3h	SCSI	
SCSI_CANNOT_ADD_IID_IN_FREE_Q	2C4h	SCSI	
SCSI_IID_LOST_IN_FREE_Q	2C5h	SCSI	
SCSI_INITIATOR_ADDED_LOST	2C6h	SCSI	
SCSI_REMOVE_AN_UNKNOWN_INITIATOR	2C7h	SCSI	
SCSI_LRU_LOGOUT_FAILED_LRU_REMOVE_IID	2C8h	SCSI	
SCSI_LRU_LOGOUT_FAILED_FREE_IID_Q_ADD_IID	2C9h	SCSI	
SCSI_LRU_LOGOUT_FAILED_IID_RESERVED	2CAh	SCSI	
SCSI_LRU_UPDATE_FAILED_LRU_REMOVE_IID	2CBh	SCSI	
SCSI_LRU_UPDATE_FAILED_LRU_ADD_IID	2CCh	SCSI	
SCSI_IID_RUN_OUT_OF_RESOURCES	2CDh	SCSI	
SCSI_IID_NEEDS_TO_LOGOUT	2CEh	SCSI	
SCSI_ADD_NULL_PTR_NEXUS_DB	2CFh	SCSI	
SCSI_EXISTING_NEXUS_HAS_DIFFERENT_PCMD	2D0h	SCSI	
SCSI_CA_ACA_FLAGS_BOTH_SET	2D1h	SCSI	

Message	VSCQ	Type	Definition
SCSI_HAPI_UNEXPECTED_RECORD_TYPE	2D2h	SCSI	
SCSI_UNKNOWN_SIGNAL_NODE	2D3h	SCSI	
SCSI_INVALID_COMMAND_DONE_SIGNAL_NODE	2D4h	SCSI	
SCSI_UNKNOWN_TASK_MANAGEMENT_SIGNAL_ NODE	2D5h	SCSI	
SCSI_UNKNOWN_THRESHOLD_INTERRUPT	2D6h	SCSI	
SCSI_NULL_PSCSIINFO_FROM_DMA	2D7h	SCSI	
SCSI_STREAMOP_BUT_VALID_PACTIVE_CMD	2D8h	SCSI	
SCSI_FCP_INVALID_PORT_NUMBER_GET_WWN	2D9h	SCSI	
SCSI_FCP_INVALID_PORT_NUMBER_ID_CHANGE	2DAh	SCSI	
SCSI_FCP_PORT_DB_ENTRY_NOT_FOUND	2DBh	SCSI	
SCSI_FCP_INVALID_PORT_NUMBER_ATTACH_CH ANGE	2DCh	SCSI	
SCSI_STDF_RESTART_DUE_TO_FAILURE	2DDh	SCSI	
SCSI_STDF_UNKNOWN_FAILURE	2DEh	SCSI	
SCSI_STDF_ASSERTION_FAILURE	2DFh	SCSI	
SCSI_STDF_COMPONENT_VERSION_MISMATCH	2E0h	SCSI	
SCSI_STDF_STARTUP_FAILURE	2E1h	SCSI	
SCSI_STDF_DYNAMIC_CONFIGURATION_FAILUR E	2E2h	SCSI	
SCSI_STDF_UNEXPECTED_OS_BEHAVIOR	2E3h	SCSI	
SCSI_STDF_INTERNAL_GENERAL_FAILURE	2E4h	SCSI	
SCSI_STDF_INTERNAL_INIT_FAILURE	2E5h	SCSI	
SCSI_STDF_LOGICAL_UNIT_INIT_FAILURE	2E6h	SCSI	
SCSI_STDF_SD_CONTROLLER_HARDWARE_FAIL URE	2E7h	SCSI	
SCSI_STDF_TRANSPORT_PROTOCOL_FAILURE	2E8h	SCSI	
SCSI_STDF_CONFIGURATION_PARAMETER_ERR OR	2E9h	SCSI	
SCSI_STDF_INTERRUPT_NESTING_OVERFLOW	2EAh	SCSI	
SCSI_STDF_INSUFFICIENT_DYNAMIC_MEMORY	2EBh	SCSI	
SCSI_STDF_MEMORY_POOL_MISMANAGEMENT	2ECh	SCSI	
SCSI_STDF_DYNAMIC_MEMORY_CORRUPTION	2EDh	SCSI	
SCSI_STDF_BAD_DATA_STRUCTURE_FORMAT	2EEh	SCSI	
SCSI_SET_THRESHOLD_NOT_SIZE_ERR	2F4h	SCSI	
SCSI_SAPI_GET_CMD_REF_NULL	2F5h	SCSI	
SCSI_INVALID_MICROCODE_UPDATE_TYPE	2F6h	SCSI	
SCSI_CREATE_SENSE_FAILED	2F7h	SCSI	
SCSI_INITIALIZE_SENSE_FAILED	2F8h	SCSI	
SCSI_UNKNOWN_CM_EEPROM_STATE	2F9h	SCSI	
SCSI_INVALID_LOG_PARAMETER	2Fah	SCSI	
SCSI_INVALID_LOG_PAGE	2FBh	SCSI	
SCSI_INVALID_LOG_PAGE_CONTROL	2FCh	SCSI	
SCSI_PAGE_OUT_OF_RANGE	2FDh	SCSI	Log page out of range
SCSI_UNKNOWN_LOG_INFO_RESPONSE	2FEh	SCSI	Unknown log information response
SCSI_UNKNOWN_LOG_INFO_RESPONSE_DATA_ POINTER	2FFh	SCSI	Unknown log information response data pointer
SRV_CMDPROC_CMD_REJECT_ABORT_IN_PROG RESS	300h	Servo	Abort command rejected since al- ready aborting.
SRV_CMDPROC_CMD_REJECT_SEQUENCER_BU	301h	Servo	Mechanical command rejected

Message	VSCQ	Type	Definition
SY			
SRV_CMDPROC_PARAMETER_OUT_OF_RANGE	302h	Servo	Parameter out of range for command.
SRV_CMDPROC_SETTAPETHICK_API_REJECT_BUSY	303h	Servo	API SetTapeThick failed
SRV_CMDPROC_SETTENSION_API_REJECT_BUSY_IN_STATUS_REQUEST	304h	Servo	API SetTension failed
SRV_CMDPROC_SETRADIUSCOUNTER_API_REJECT_BUSY	305h	Servo	API SetRadiusCounter failed
SRV_CMDPROC_INVALID_COMMAND_IN_SET_PARAMETER	306h	Servo	Invalid parameter in set parameter function.
SRV_REEL_AT_SPEED_MESSAGE_RECEIVED_IN_IDLE_STATE	307h	Servo	AT_SPEED message received in idle state.
SRV_REEL_TRACKING_MESSAGE_RECEIVED_IN_IDLE_STATE	308h	Servo	TRACKING message received in idle state.
SRV_REEL_AT_SPEED_MESSAGE_RECEIVED_IN_HOLD_STATE	309h	Servo	AT_SPEED message received in hold state.
SRV_REEL_TRACKING_MESSAGE_RECEIVED_IN_HOLD_STATE	30Ah	Servo	TRACKING message received in hold state.
SRV_MOVETAPE_FORWARD_PHYSICAL_LIMIT_OVERRUN_DURING_RAMP_DOWN	30Bh	Servo	Forward Physical limit exceeded in ramp down state.
SRV_MOVETAPE_REVERSE_PHYSICAL_LIMIT_UNDERRUN_DURING_RAMP_DOWN	30Ch	Servo	Reverse physical limit exceeded in ramp down state.
SRV_MOVETAPE_FORWARD_PHYSICAL_LIMIT_OVERRUN_DURING_RAMP_DOWN_RESTART	30Dh	Servo	Forward physical limit exceeded in ramp down restart state.
SRV_MOVETAPE_REVERSE_PHYSICAL_LIMIT_UNDERRUN_DURING_RAMP_DOWN_RESTART	30Eh	Servo	Reverse physical limit exceeded in ramp down restart state.
SRV_SEQ_SUBCOMMAND_TIMED_OUT	30Fh	Servo	Subcommand timeout in sequencer.
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR1	310h	Servo	expecting steps done, HALT3
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR2	311h	Servo	expecting SNS13 low
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR3	312h	Servo	expecting steps done, DISENGAGE_LEADER
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR4	313h	Servo	failed to remove slack
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR5	314h	Servo	failed to release pin
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR6	315h	Servo	motor stall waiting for HALT4
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR7	316h	Servo	expecting steps done, HALT4
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR8	317h	Servo	exceded retrys
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR9	318h	Servo	motor stall waiting for SNS13 high
SRV_MOVETAPE_RAMP_DOWN_FAILED_IN_RAMP_DOWN_AT_LPOS_FROM_CRUISE_CONTROL_FORWARD	319h	Servo	Ramp down failed in ramp_down_at_lpos_from_cruise_control in forward direction.
SRV_MOVETAPE_RAMP_DOWN_FAILED_IN_RAMP_DOWN_AT_LPOS_FROM_CRUISE_CONTROL_REVERSE	31Ah	Servo	Ramp down failed in ramp_down_at_lpos_from_cruise_control in reverse direction.
SRV_MOVETAPE_INVALID_DIRECTION_IN_RAMP_DOWN_AT_LPOS_FROM_CRUISE_CONTROL	31Bh	Servo	Tape not moving, in ramp_down_at_lpos_from_cruise_c

Message	VSCQ	Type	Definition
			ontrol.
SRV_MOVETAPE_LPOS_RECEIVED_BEFORE_TRACKING_IN_RAMP_UP_STATE	31Ch	Servo	LPOS notification received before ramp up completed.
SRV_CMDPROC_TAPE_NOT_MOVING_FOR_REPOSITION_CMD	31Dh	Servo	Reposition cmd rejected, tape not moving
SRV_MOVETAPE_REPOSITION_FAILED_ALREADY_PAST_LPOS	31Eh	Servo	LPOS already exceeded in reposition_from_idle
SRV_CMD_INVALID_HEADPOSITION_SELECTED_LOOKUP_TRACKING_RATIO	31Fh	Servo	Invalid head position selected in looking up tracking ratio
SRV_MOVETAPE_INVALID_TAPE_DIRECTION_IN_ENABLE_HEAD_BIAS_FOR_READ_TRACKING	320h	Servo	Invalid tape direction was selected in enable head bias function
SRV_MOVETAPE_INVALID_TAPE_DIRECTION_IN_ENABLE_HEAD_BIAS_FOR_WRITE_TRACKING	321h	Servo	Invalid tape direction selected in enable head bias function
SRV_MOVETAPE_INVALID_TRACKING_MODE_IN_ENABLE_HEAD_BIAS	322h	Servo	Invalid tracking mode selected in enable bias function
SRV_GOTO_LC_FORWARD_PHYSICAL_LIMIT_OVERRUN_DURING_RAMP_UP	323h	Servo	Physical limit exceded during goto_lc_ramp_up state.
SRV_GOTO_LC_REVERSE_PHYSICAL_LIMIT_UNDERRUN_DURING_RAMP_UP	324h	Servo	Physical limit exceded during goto_lc_ramp_up state.
SRV_GOTO_LC_FORWARD_PHYSICAL_LIMIT_OVERRUN_DURING_WAIT_MARK	325h	Servo	Physical limit exceded during goto_lc_wait_mark state.
SRV_GOTO_LC_REVERSE_PHYSICAL_LIMIT_UNDERRUN_DURING_WAIT_MARK	326h	Servo	Physical limit exceded during goto_lc_wait_mark_state.
SRV_GOTO_LC_FORWARD_PHYSICAL_LIMIT_OVERRUN_DURING_MARK_FOUND	327h	Servo	Physical limit exceded during goto_lc_mark_found state.
SRV_GOTO_LC_REVERSE_PHYSICAL_LIMIT_UNDERRUN_DURING_MARK_FOUND	328h	Servo	Physical limit exceded during goto_lc_mark_found state.
SRV_GOTO_LC_FORWARD_PHYSICAL_LIMIT_OVERRUN_DURING_POSITION_TAPE	329h	Servo	Physical limit exceded during position tape state.
SRV_GOTO_LC_REVERSE_PHYSICAL_LIMIT_UNDERRUN_DURING_POSITION_TAPE	32Ah	Servo	Physical limit exceded during position tape state.
SRV_GOTO_LC_INITREELS_API_BUSY_REJECT	32Bh	Servo	
SRV_STEPPER_MOTOR_TASK_INVALID_OPERATION	32Ch	Servo	
SRV_STEP_LOAD_CART_ERROR1	32Dh	Servo	expecting SNS1 high
SRV_STEP_LOAD_CART_ERROR2	32Eh	Servo	expecting steps done
SRV_STEP_LOAD_CART_ERROR3	32Fh	Servo	expecting SNS1 low
SRV_STEP_LOAD_CART_ERROR4	330h	Servo	expecting steps done, HALT1
SRV_STEP_LOAD_CART_DEFAULT	331h	Servo	invalid state in process_load_cart function
SRV_STEP_UNLOAD_CART_ERROR1	332h	Servo	expecting SNS2 low
SRV_STEP_UNLOAD_CART_ERROR2	333h	Servo	expecting steps done
SRV_STEP_UNLOAD_CART_DEFAULT	334h	Servo	invalid state in process_unload_cart function
SRV_STEP_THREAD_TAPE_ERROR1	335h	Servo	failed to remove tape slack
SRV_STEP_PWR_RECOVERY_LOAD_CART_ERROR1	336h	Servo	expecting SNS1 high
SRV_STEP_PWR_RECOVERY_LOAD_CART_ERROR2	337h	Servo	expecting steps done
SRV_STEP_PWR_RECOVERY_LOAD_CART_ERROR3	338h	Servo	expecting serial eeprom done
SRV_STEP_PWR_RECOVERY_LOAD_CART_ERROR4	339h	Servo	expecting SNS1 low

Message	VSCQ	Type	Definition
SRV_STEP_THREAD_TAPE_ERROR6	33Ah	Servo	motor stall waiting for HALT1
SRV_STEP_THREAD_TAPE_ERROR7	33Bh	Servo	expecting steps done, HALT1
SRV_STEP_THREAD_TAPE_ERROR8	33Ch	Servo	expecting MECH_DELAY1_DONE
SRV_STEP_THREAD_TAPE_ERROR9	33Dh	Servo	motor stall waiting for SNS13 high
SRV_STEP_THREAD_TAPE_ERROR10	33Eh	Servo	expecting SNS13 high
SRV_STEP_THREAD_TAPE_ERROR11	33Fh	Servo	motor stall waiting for ENGAGED_LEADER
SRV_STEP_THREAD_TAPE_ERROR12	340h	Servo	expecting steps done,ENGAGED_LEADER
SRV_STEP_THREAD_TAPE_ERROR13	341h	Servo	timer failure, MECH_DELAY2
SRV_STEP_THREAD_TAPE_ERROR14	342h	Servo	expecting MECH_DELAY2_DONE
SRV_STEP_THREAD_TAPE_ERROR15	343h	Servo	motor stall, WAITING_HALT2 MECH_DELAY2_DONE
SRV_STEP_THREAD_TAPE_ERROR16	344h	Servo	expecting steps done, HALT2
SRV_STEP_THREAD_TAPE_ERROR17	345h	Servo	we missed the pin or dropped it
SRV_STEP_THREAD_TAPE_ERROR18	346h	Servo	motor stall CHECK_PROGRESS
SRV_STEP_THREAD_TAPE_ERROR19	347h	Servo	expecting SNS7, CHECK_PROGRESS
SRV_STEP_PWR_RECOVERY_LOAD_CART_ERROR5	348h	Servo	expecting steps done, HALT1
SRV_STEP_PWR_RECOVERY_LOAD_CART_ERROR6	349h	Servo	expecting SNS2 low
SRV_STEP_THREAD_TAPE_ERROR22	34Ah	Servo	motor stall waiting for steps done
SRV_STEP_THREAD_TAPE_ERROR23	34Bh	Servo	expected STEPS_DONE
SRV_STEP_THREAD_TAPE_DEFAULT	34Ch	Servo	invalid state in process_thread_tape function
SRV_STEP_PWR_RECOVERY_LOAD_CART_ERROR7	34Dh	Servo	expecting steps done
SRV_STEP_UNTHREAD_TAPE_ERROR2	34Eh	Servo	motor stall, expecting steps done, HALT1
SRV_STEP_PWR_RECOVERY_LOAD_CART_ERROR8	34Fh	Servo	expecting eerpom done
SRV_STEP_PWR_RECOVERY_LOAD_CART_DEFAULT	350h	Servo	invalid state in srv_dcl_loadCartridgePoweronRecovery function
SRV_STEP_UNTHREAD_TAPE_ERROR6	351h	Servo	motor stall waiting, HALT1
SRV_STEP_UNTHREAD_TAPE_ERROR7	352h	Servo	expecting steps done, HALT1
SRV_STEP_LOAD_CART_ERROR5	353h	Servo	expecting serial eeprom done
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR10	354h	Servo	expecting SNS13 high
SRV_STEP_UNTHREAD_TAPE_ERROR10	355h	Servo	motor stall waiting, HALT3
SRV_STEP_UNTHREAD_TAPE_ERROR11	356h	Servo	expecting steps done, HALT3
SRV_STEP_UNTHREAD_TAPE_ERROR12	357h	Servo	expecting SNS13 low
SRV_STEP_UNTHREAD_TAPE_ERROR13	358h	Servo	expecting steps done, DISENGAGE_LEADER
SRV_STEP_UNTHREAD_TAPE_ERROR14	359h	Servo	failed to remove slack
SRV_STEP_UNTHREAD_TAPE_ERROR15	35Ah	Servo	failed to release pin
SRV_STEP_UNTHREAD_TAPE_ERROR16	35Bh	Servo	motor stall waiting for HALT4
SRV_STEP_UNTHREAD_TAPE_ERROR17	35Ch	Servo	expecting steps done, HALT4
SRV_STEP_UNTHREAD_TAPE_DEFAULT	35Dh	Servo	invalid state in process_unthread_tape function
SRV_STEP_MOTOR_ERROR1	35Eh	Servo	expecting steps done

Message	VSCQ	Type	Definition
SRV_STEP_STEP_MOTOR_DEFAULT	35Fh	Servo	invalid state in process_step_motor function
SRV_STEP_HEAD_INVALID_WRAP	360h	Servo	invalid wrap value
SRV_STEP_HEAD_EXPECTING_STOP_AFTER_MOVING_TO_POSITION	361h	Servo	expecting HALT1
SRV_STEP_HEAD_EXPECTING_STOP_AFTER_ADDED_HYSTERESIS	362h	Servo	expecting steps done
SRV_STEP_HEAD_EXPECTING_TOP_SENSOR_HIGH	363h	Servo	expecting SNS9 high
SRV_STEP_HEAD_EXPECTING_STOP_AFTER_TOP_SENSOR_HIGH	364h	Servo	expecting HALT2
SRV_STEP_HEAD_EXPECTING_TOP_SENSOR_LOW	365h	Servo	expecting SNS9 low
SRV_STEP_HEAD_EXPECTING_STOP_AFTER_TOP_SENSOR_LOW	366h	Servo	expecting HALT3
SRV_STEP_HEAD_STEP_DEFAULT	367h	Servo	invalid state in process_head_step function
SRV_STEP_STEP_DEFAULT	368h	Servo	invalid state in step function
SRV_STEP_SETUP_MOTOR_CONTROL_DEFAULT	369h	Servo	invalid state in setup_motor_control function
SRV_STEP_RETRY_THREAD_TAPE_ERROR1	36Ah	Servo	expecting HALT1
SRV_STEP_RETRY_THREAD_TAPE_ERROR2	36Bh	Servo	expecting SNS13 low
SRV_STEP_RETRY_THREAD_TAPE_ERROR3	36Ch	Servo	expecting steps done
SRV_STEP_RETRY_THREAD_TAPE_DEFAULT	36Dh	Servo	invalid state in retry_thread_tape function
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR11	36Eh	Servo	motor stall waiting for ENGAGED_LEADER
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_ERROR12	36Fh	Servo	expecting steps done,ENGAGED_LEADER
SRV_STEP_PWR_RECOVERY_THREAD_TAPE_DEFAULT	370h	Servo	invalid state in srv_dcl_threadTapePoweronRecovery function
SRV_STEP_GOFROM_HUB_TOPARK_ERROR1	371h	Servo	expecting steps done
SRV_STEP_GOFROM_HUB_TOPARK_DEFAULT	372h	Servo	invalid state in srv_gofrom_hub_topark function
SRV_STEP_THREAD_TAPE_ERROR26	373h	Servo	expected serial eeprom done
SRV_STEP_UNTHREAD_TAPE_ERROR3	374h	Servo	expecting steps done
SRV_STEP_NO_ACTIVE_PWR_RECOVERY_THREAD_RETRY_ISR	375h	Servo	error recovery ran without an active function
SRV_STEP_FIND_PARK_ERROR1	376h	Servo	expecting SNS7 or SNS8
SRV_STEP_FIND_PARK_ERROR2	377h	Servo	motor stall while waiting for SNS7
SRV_STEP_FIND_PARK_ERROR3	378h	Servo	expecting SNS7 high
SRV_STEP_FIND_PARK_ERROR4	379h	Servo	motor stalled
SRV_STEP_FIND_PARK_ERROR5	37Ah	Servo	one or more bicell sensor(s) are bad
SRV_STEPPER_MOTOR_TASK_EEPROM_INVALID_OPERATION	37Bh	Servo	state machine did not expect sate returned from EEPROM_TSK
SRV_STEP_RETRY6_ERROR1	37Ch	Servo	exceeded retries
SRV_STEP_FIND_PARK_DEFAULT	37Dh	Servo	invalid state in srv_find_park function
SRV_STEP_RETRY6_ERROR2	37Eh	Servo	motor stall waiting for steps done
SRV_STEP_GOTO_HUB_ERROR2	37Fh	Servo	expecting steps done
SRV_STEP_GOTO_HUB_DEFAULT	380h	Servo	invalid state in srv_goto_hub func-

Message	VSCQ	Type	Definition
			tion
SRV_STEP_RETRY6_ERROR3	381h	Servo	expected STEPS_DONE
SRV_STEP_RETRY6_DEFAULT	382h	Servo	invalid state in srv_dcl_retry_leave_hub function
SRV_STEP_INTO_CART_ERROR3	383h	Servo	expecting steps done
SRV_STEP_INTO_CART_DEFAULT	384h	Servo	invalid state in srv_into_cart function
SRV_STEP_PARK_LA_ERROR1	385h	Servo	expecting steps done
SRV_STEP_PARK_LA_DEFAULT	386h	Servo	invalid state in srv_park_la function
SRV_STEP_LWR_ENGAGE_ERROR1	387h	Servo	expecting SNS13 high
SRV_STEP_LWR_ENGAGE_ERROR2	388h	Servo	expecting steps done
SRV_STEP_LWR_ENGAGE_DEFAULT	389h	Servo	invalid state in srv_lwr_engage function
SRV_STEP_LWR_DISENGAGE_ERROR1	38Ah	Servo	expecting SNS13 low
SRV_STEP_LWR_DISENGAGE_ERROR2	38Bh	Servo	expecting steps done
SRV_STEP_LWR_DISENGAGE_DEFAULT	38Ch	Servo	invalid state in srv_lwr_disengage function
SRV_STEP_RETRY4_ERROR5	38Dh	Servo	exceeded retries recovering from srv_dcl_retry_stuck_on_guides
SRV_STEP_CART_REEL_RUNAWAY	38Eh	Servo	the cart reel moved more than expected (missed leader/broke tape?)
SRV_STEP_LOAD_ARM_MOTOR_STALLED	38Fh	Servo	the load arm motor stalled
SRV_STEP_CART_LOAD_MOTOR_STALL	390h	Servo	the cart load motor stalled
SRV_STEP_CART_NOT_IN	391h	Servo	the cartridge is not fully inserted
SRV_CAL_MOT_MOVE	392h	Servo	reel motor moved during bias calibration
SRV_CAL_MOT_STOP	393h	Servo	reel motor failed to stop during bias calibration
SRV_STATEM_COMMAND_SOURCE_INVALID_IN_IDLE_MODE	394h	Servo	message not from cmd processor task
SRV_CMD_CALIBATE_ALL_FAILED_WRITING_TO_LINEAR_COUNTER_API_BUSY	395h	Servo	calibrate all failed trying to reset the linear counter
SRV_CMD_FIND_INDEX_FAILED_WRITING_TO_LINEAR_COUNTER_API_BUSY	396h	Servo	find index command failed writing to linear counter - the api was busy
SRV_EVENTS_TABLE_INTEGRITY_ERROR	397h	Servo	Events table integrity error. Ids donot match index.
SRV_FINDZEROWRAP_API_REJECTED_BUSY_STATE	398h	Servo	find_zero_wrap() API call failed
SRV_CMDPROC_EJECT_REJECTED_NO_TAPE_READY	399h	Servo	Eject command rejected by command processor
SRV_STEP_UNTHREAD_TAPE_ERROR18	39Ah	Servo	motor stall waiting for SNS7 high while parking
SRV_STEP_UNTHREAD_TAPE_ERROR19	39Bh	Servo	expecting SNS7 high (park)
SRV_CMDPROC_EJECT_REJECTED_TAPE_MOVING	39Ch	Servo	Eject command rejected by command processor - tape was moving
SRV_REEL_UNEXPECTED_MESSAGE_IN_USER_ABORT_REEL_STATE	39Dh	Servo	Unexpected message received in user abort reel state of reel task
SRV_REEL_UNEXPECTED_MESSAGE_IN_ERROR_ABORT_REEL_STATE	39Eh	Servo	Unexpected message received in error abort reel state of reel task
SRV_REEL_UNEXPECTED_MESSAGE_IN_USER_ABORT_TAPE_STATE	39Fh	Servo	Unexpected message received in user abort tape state of reel task
SRV_STEP_RETRY2_ERROR1	3A0h	Servo	motor stall waiting for HALT3
SRV_STEP_RETRY2_ERROR2	3A1h	Servo	expecting steps done, HALT3

Message	VSCQ	Type	Definition
SRV_STEP_RETRY2_ERROR3	3A2h	Servo	expecting SNS13 low
SRV_STEP_RETRY2_ERROR4	3A3h	Servo	expecting steps done, DISENGAGE_LEADER
SRV_STEP_RETRY2_ERROR5	3A4h	Servo	failed to remove slack
SRV_STEP_RETRY2_ERROR6	3A5h	Servo	failed to release pin
SRV_STEP_RETRY2_ERROR7	3A6h	Servo	motor stall waiting for HALT4
SRV_STEP_RETRY2_ERROR8	3A7h	Servo	expecting steps done, HALT4
SRV_STEP_RETRY2_ERROR9	3A8h	Servo	motor stall waiting for HALT4
SRV_STEP_RETRY2_ERROR10	3A9h	Servo	expecting steps done, HALT4
SRV_STEP_RETRY2_ERROR11	3AAh	Servo	motor stall waiting for HALT4
SRV_STEP_RETRY2_ERROR12	3ABh	Servo	expecting steps done, HALT4
SRV_STEP_RETRY2_DEFAULT	3ACh	Servo	invalid state in process_head_step function
SRV_STEP_RETRY3_ERROR1	3ADh	Servo	expecting SNS13 low
SRV_STEP_RETRY3_ERROR2	3AEh	Servo	expecting SNS13 high
SRV_STEP_RETRY3_ERROR3	3AFh	Servo	expecting steps done
SRV_STEP_RETRY3_DEFAULT	3B0h	Servo	invalid state in retry_unthread_tape function
SRV_STEP_RETRY4_ERROR1	3B1h	Servo	motor stall waiting for steps done
SRV_STEP_RETRY4_ERROR2	3B2h	Servo	expected STEPS_DONE
SRV_STEP_RETRY4_DEFAULT	3B3h	Servo	invalid state in re-try_stuck_on_guides function
SRV_STEP_RETRY4_ERROR3	3B4h	Servo	motor stall waiting for steps done
SRV_STEP_RETRY4_ERROR4	3B5h	Servo	expected STEPS_DONE
SRV_STEP_GOFROM_HUB_GRABER_ERROR1	3B6h	Servo	expecting steps done
SRV_STEP_GOFROM_HUB_GRABER_ERROR2	3B7h	Servo	motor stall
SRV_STEP_GOFROM_HUB_GRABER_ERROR3	3B8h	Servo	expecting steps done
SRV_STEP_GOFROM_HUB_GRABER_DEFAULT	3B9h	Servo	invalid state in srv_gofrom_hub_graber function
SRV_STEP_LA_INTO_CART_ERROR1	3BAh	Servo	expecting SNS13 low
SRV_STEP_LA_INTO_CART_ERROR2	3BBh	Servo	expecting steps done, DISENGAGE_LEADER
SRV_STEP_LA_INTO_CART_ERROR3	3BCh	Servo	expecting steps done
SRV_STEP_LA_INTO_CART_DEFAULT	3BDh	Servo	invalid state in srv_move_loadarm_into_cart function
SRV_STEP_LOAD_ARM_MOTOR_STALLED1	3BEh	Servo	the load arm motor stalled
SRV_STEP_MOTOR_ERROR2	3BFh	Servo	expecting steps done
SRV_STEP_PARK_LA_CMD_ERROR1	3C0h	Servo	expecting steps done
SRV_STEP_PARK_LA_CMD_DEFAULT	3C1h	Servo	invalid state in srv_park_loadarm function
SRV_STEP_RETRY_FAILED1	3C2h	Servo	exceded retrys
SRV_STEP_RETRY_FAILED2	3C3h	Servo	exceded retrys
SRV_STEP_UNTHREAD_TAPE_ERROR20	3C4h	Servo	motor stall waiting for SNS13 high
SRV_STEP_UNTHREAD_TAPE_ERROR21	3C5h	Servo	expecting SNS13 high
SRV_STEP_UNTHREAD_TAPE_ERROR22	3C6h	Servo	motor stall waiting for ENGAGED_LEADER
SRV_STEP_UNTHREAD_TAPE_ERROR23	3C7h	Servo	expecting steps done,ENGAGED_LEADER
SRV_STEP_THREAD_TAPE_ERROR24	3C8h	Servo	expecting SNS13 low
SRV_STEP_THREAD_TAPE_ERROR25	3C9h	Servo	expecting steps done,

Message	VSCQ	Type	Definition
			DISENGAGE_LEADER
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR1	3CAh	Servo	expecting steps done, HALT3
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR2	3CBh	Servo	expecting SNS13 low
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR3	3CCh	Servo	expecting steps done, DISENGAGE_LEADER
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR4	3CDh	Servo	failed to remove slack
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR5	3CEh	Servo	failed to release pin
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR6	3CFh	Servo	motor stall waiting for HALT4
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR7	3D0h	Servo	expecting steps done, HALT4
SRV_STEP_NO_ACTIVE_PWR_RECOVERY_UNTHREAD_RETRY_ISR	3D1h	Servo	retries running with out an active function
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR8	3D2h	Servo	exceeded retries
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR9	3D3h	Servo	motor stall waiting for SNS13 high
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR10	3D4h	Servo	expecting SNS13 high
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR11	3D5h	Servo	motor stall waiting for ENGAGED_LEADER
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_ERROR12	3D6h	Servo	expecting steps done,ENGAGED_LEADER
SRV_STEP_PWR_RECOVERY_UNTHREAD_TAPE_DEFAULT	3D7h	Servo	invalid state in srv_dcl_unthreadTapePoweronRecovery function
SRV_STEP_NO_ACTIVE_ISR	3D8h	Servo	the step isr was call without an active function
SRV_STEP_NO_ACTIVE_THREAD_RETRY_ISR	3D9h	Servo	the retry step isr was call without an active function
SRV_STEP_NO_ACTIVE_UNTHREAD_RETRY_ISR	3DAh	Servo	the retry step isr was call without an active function
SRV_STEP_RETRY5_ERROR1	3DBh	Servo	motor stall waiting for steps done
SRV_STEP_RETRY5_ERROR2	3DCh	Servo	expected STEPS_DONE
SRV_STEP_RETRY5_ERROR3	3DDh	Servo	motor stall waiting for steps done
SRV_STEP_RETRY5_ERROR4	3Deh	Servo	expected STEPS_DONE
SRV_STEP_RETRY5_DEFAULT	3DFh	Servo	invalid state in retry_put_away_pin function
SRV_STEP_MOTOR_PWR_FAIL	3E0h	Servo	reel motor power fail condition while unthreading
SRV_STEP_CENTER_PIN_DEFAULT	3E1h	Servo	invalid state in srv_center_pin_in_hub function
SRV_STEP_CENTER_PIN_ERROR1	3E2h	Servo	motor stall waiting for HALT1
SRV_STEP_CENTER_PIN_ERROR2	3E3h	Servo	expecting steps done, HALT1
SRV_STEP_RETRY5_ERROR5	3E4h	Servo	motor stall waiting for SNS13 high
SRV_STEP_RETRY5_ERROR6	3E5h	Servo	expecting SNS13 high
SRV_STEP_RETRY5_ERROR7	3E6h	Servo	motor stall waiting for ENGAGED_LEADER
SRV_STEP_RETRY5_ERROR8	3E7h	Servo	expecting steps

Message	VSCQ	Type	Definition
			done,ENGAGED_LEADER
SRV_STEP_RETRY5_ERROR9	3E8h	Servo	motor stall waiting for steps done
SRV_STEP_RETRY5_ERROR10	3E9h	Servo	expected STEPS_DONE
SRV_STEP_UNLOAD_CART_ERROR3	3Eah	Servo	expecting eerpom done
SRV_RECOVER_BIN_ERROR	3Ebh	Servo	an unspecified error occurred while accessing the serial EEPROM
SRV_RECOVER_EEPROM_DEFAULT	3Ech	Servo	invalid state in the re-cover_drive_state function
SRV_TEST_SEEP_DEFAULT	3Edh	Servo	invalid state in the test_seep func-tion
SRV_STEP_NO_ACTIVE_FUNCTION_FOR_EEPROM_TASK	3Eeh	Servo	no command handler was installed to handle completion fro EEPROM_TSK
SRV_SERIAL_EEPROM_ERROR	3Efh	Servo	expect good status fro serial eer-pom task
SRV_STEP_THREAD_TAPE_ERROR27	3F0h	Servo	expecting eeprom done
SRV_STEP_RETRY2_ERROR13	3F1h	Servo	motor stall waiting for HALT4
SRV_STEP_RETRY2_ERROR14	3F2h	Servo	expecting steps done, HALT4
SRV_STEP_RETRY7_ERROR1	3F3h	Servo	motor stall waiting for steps done
SRV_STEP_RETRY7_ERROR2	3F4h	Servo	expected STEPS_DONE
SRV_STEP_RETRY7_DEFAULT	3F5h	Servo	invalid state in srv_dcl_retry_failed_park function
SRV_STEP_THREAD_TAPE_ERROR28	3F6h	Servo	reel motor stalled adding slack
SRV_STEP_THREAD_TAPE_ERROR29	3F7h	Servo	unexpected error adding slack
SRV_STEP_THREAD_TAPE_ERROR30	3F8h	Servo	reel motor stalled removing added slack
SRV_STEP_THREAD_TAPE_ERROR31	3F9h	Servo	unexpected error removing added slack
SRV_STEP_GOTO_HUB_ERROR1	3Fah	Servo	expecting SNS2 low
SRV_STEP_GOTO_HUB_ERROR3	3FBh	Servo	expecting steps done
SRV_STEP_REEL_TASK_RETURNED_MISCHUCKED_CARTRIDGE	3FCh	Servo	Reel motor task indicated that the teeth on the hub did not line up with the cartridge
SRV_UNTHREAD_DELAY_ERROR_BEFORE_MOVING_TO_PARK	3FDh	Servo	Error occurred during unthread moving from dropping off the pin-reel motor task indicated that the teeth on the hub did not line up with the cartridge
SRV_UNTHREAD_ERROR_MOVING_TO_PARK	3FEh	Servo	Load arm failed to make it back to park while unthreading
SRV_UNTHREAD_FAILED_TO_PUT_PIN_AWAY	3FFh	Servo	Unthread exhausted retries trying to park pin in cartridge
RTOS_STATUS_TASK_ID_ERROR	400h	RTOS	
RTOS_STATUS_NO_MEMORY_AVAILABLE	401h	RTOS	
RTOS_STATUS_MAILBOX_IN_USE	402h	RTOS	
RTOS_STATUS_ZERO_MESSAGE	403h	RTOS	
RTOS_STATUS_INVALID_SYSTEM_CALL	404h	RTOS	
RTOS_STATUS_TIMEOUT	405h	RTOS	
RTOS_STATUS_NO_MESSAGE_PRESENT	406h	RTOS	
RTOS_STATUS_QUEUE_ID_ERROR	407h	RTOS	
RTOS_STATUS_QUEUE_FULL	408h	RTOS	
RTOS_STATUS_PARTITION_ID_ERROR	409h	RTOS	

Message	VSCQ	Type	Definition
RTOS_STATUS_INVALID_CONFIGURATION_PARAMETER	40Ah	RTOS	
RTOS_STATUS_INVALID_INPUT_PARAMETER	40Bh	RTOS	
RTOS_STATUS_TASK_PENDING_ON_QUEUE	40Ch	RTOS	
RTOS_STATUS_EVENT_FLAG_GROUP_AND_VIRTUAL_TIMER_ID_ERROR	40Dh	RTOS	
RTOS_STATUS_EVENT_FLAG_ALREADY_SET	40Eh	RTOS	
RTOS_STATUS_UNKNOWN_ERROR	40Fh	RTOS	
DSM_FREEPOOL_SENT_NULL_DS_IN_FEED_UND_ERRUN	440h	Data set manager	
DSM_WR_FEED_ELDC_DS_CMPL	441h	Data set manager	
DSM_WR_FEED_ELDC_DS_CMPL2	442h	Data set manager	
DSM_WR_FEED_ELDC_DS_CMPL3	443h	Data set manager	
DSM_WRONG_MODE_FOR_WRITE_CMD	444h	Data set manager	
DSM_WRONG_STATE_FOR_APPEND	445h	Data set manager	
DSM_WRONG_STATE_FOR_WRITE_CMD	446h	Data set manager	
DSM_WRITE_APPEND_DS_SHOULD_BE_EOD	447h	Data set manager	
DSM_MISSING_DS_WHEN_WRITE_CMD_RECV	448h	Data set manager	
DSM_WRONG_MODE_FOR_APPEND	449h	Data set manager	
DSM_WR_MAN_FLUSH_TIMEOUT	44Ah	Data set manager	
DSM_WRITE_DSLIST_HAS_TOO_MANY_DS	44Bh	Data set manager	
DSM_LOCATE_FMK_0_COUNT	44Ch	Data set manager	
DSM_LOCATE_SPACED_PAST_TARGET	44Dh	Data set manager	
DSM_HALT_BIT_WORKAROUND_FAILURE	44Eh	Data set manager	
DSM_HALT_BIT_WORKAROUND_FAILURE2	44Fh	Data set manager	
DSM_DCA_PUT_ERROR_FAILED	450h	Data set manager	
DSM_DCA_PUT_HERR_FAILED	451h	Data set manager	
DSM_DCA_PUT_EOD_FAILED	452h	Data set manager	
DSM_READ_UNEXPECTED_SCSI_STATE	453h	Data set manager	
DSM_READ_UNEXPECTED_BACKEND_STATE	454h	Data set manager	
DSM_READ_UNEXPECTED_MODE	455h	Data set manager	
DSM_BE_NO_HANDLE	456h	Data set manager	
DSM_CMPR_READ_NO_ACCESS_POINT_IN_DS	457h	Data set manager	
DSM_CMPR_SKIP_NO_ACCESS_POINT_IN_DS	458h	Data set manager	
DSM_READ_PUT_TERMINUS_FAILED	459h	Data set manager	
DSM_ILLEGAL_WRITE_TERMINATED_CONDITION	45Ah	Data set manager	
DSM_CMPR_SKIP_ADD_DS_FAILED	45Bh	Data set manager	
DSM_CMPR_SKIP_DSIT_C1_ERROR	45Ch	Data set manager	
DSM_CMPR_SKIP_UNEXPECTED_UNDERRUN	45Dh	Data set manager	
DSM_CMPR_SKIP_FMK_ENCOUNTERED	45Eh	Data set manager	
DSM_CMPR_SKIP_END_MARK_ENCOUNTERED	45Fh	Data set manager	
DSM_CMPR_SKIP_C1_ERROR	460h	Data set manager	
DSM_CMPR_SKIP_DP_ERROR	461h	Data set manager	
DSM_CMPR_SKIP_INVALID_INTERRUPT	462h	Data set manager	
DSM_CMPR_READ_DSIT_C1_ERROR	463h	Data set manager	
DSM_CMPR_READ_UNEXPECTED_COMMAND_COMPLETE	464h	Data set manager	
DSM_CMPR_WR_FLUSH_NOT_HALTED	465h	Data set manager	
DSM_CMPR_WR_FLUSH_DS_NULL_DS	466h	Data set manager	

Message	VSCQ	Type	Definition
DSM_CMPR_WR_DP_ERROR	467h	Data set manager	
DSM_CMPR_WR_HALT_DETECTED	468h	Data set manager	
DSM_CMPR_WR_INVALID_INTERRUPT	469h	Data set manager	
DSM_WR_NOT_IN_LOCATED_STATE	46Ah	Data set manager	
DSM_INFO_REQUEST_CONTAINS_INVALID_LOG_PAGE	46Bh	Data set manager	
DSM_BE_WR_BAD_PTR_IN_FLUSH_EOD_MIC_DONE	46Dh	Data set manager	
DSM_BE_WR_BAD_PTR_IN_DS_DONE	46Eh	Data set manager	
DSM_BE_WR_BAD_PTR_IN_EOW_DS_RECYCLE	46Fh	Data set manager	
DSM_BE_WR_BAD_PTR_IN_RECYCLE_START_WHILE_FLUSHING	470h	Data set manager	
DSM_BE_WR_BAD_PTR_IN_DS_RECYCLE	471h	Data set manager	
DSM_DCADESCPTR_OVERWRITTEN	473h	Data set manager	
DSM_MIC_TOO_MANY_QUEUED_CMDS	474h	Data set manager	
DSM_KILL_DECOMPRESSION_NEEDS_READ	475h	Data set manager	
DSM_APPEND_TYPE_WRONG	476h	Data set manager	
DSM_WRONG_APPEND_TYPE_IN_TDIR_UPDATE	477h	Data set manager	
DSM_WR_MIC_EOD_UPDATE_WITH_NULL_DS	478h	Data set manager	
DSM_WRITE_LOCATED_BUT_NO_APPEND_DS	479h	Data set manager	
DSM_WRITE_READ_PAUSED_BUT_NO_APPEND_DS	47Ah	Data set manager	
DSM_GOT_READ_WHEN_POSITION_UNKNOWN	47Bh	Data set manager	
DSM_SPACE_EOD_DS_NOT_EOD	47Ch	Data set manager	
DSM_MIC_READ_CART_PAGE_GOT_CRC	47Dh	Data set manager	
DSM_MIC_WRITE_EOD_PAGE_GOT_CRC	47Eh	Data set manager	
DSM_CMPR_SET_MAXSIZE_NOT_MODULO_32	47Fh	Data set manager	
TAPE_SERVO_NEVER_RECOVER	480h	TAPE	Write: Servo demark, and never recover.
TAPE_BAD_MIC_TD	481h	TAPE	SEEK: Bad MIC TAPE DIRECTORY page error
TAPE_BAD_MIC_EOD	482h	TAPE	SEEK: Bad MIC EOD INFORMATION page error
TAPE_FIRST_DS_APPEND_FAIL_OLD_HIGH_WPC	483h	TAPE	Write: Fail to detect the last Data Set written after enter write mode because the write pass count in old data is higher than the write pass count in last Data Set written.
TAPE_APPEND_FAIL_OLD_HIGH_WPC	484h	TAPE	Write: Fail to detect the last Data Set written because the write pass count in old data is higher than the write pass count in last Data Set written.
TAPE_WRITE_LOOP_EXT_FAIL	485h	TAPE	Write: WRITE_LOOP_EXT command fail.
TAPE_READ_SERVO_CMD_REJECT	486h	TAPE	Read: Servo cmd reject
TAPE_SERVO_GAIN_CALIB_FAIL	487h	TAPE	servo gain calib failed
TAPE_READ_SEEK_TARGET_OVERSHOOT	488h	TAPE	Read: Could not find target after seek
TAPE_READ_FOUND_TARGET_PLUS_N	489h	TAPE	Read: Detect DSn+k
TAPE_HARD_READ_ADJACENT_TRACK_IS_OVERWRITTEN	48Ah	TAPE	Read: Hard Read Error due to adjacent track is overwritten

Message	VSCQ	Type	Definition
TAPE_READ_4METERS_TIMEOUT	48Bh	TAPE	Read: Has no Data Set Interrupt for more than 4 meters
TAPE_READ_TIMEOUT_NO_SERVO_RESPONSE	48Ch	TAPE	Read: 20 seconds timeout wait for Servo response
TAPE_READ_BOW_DS_NOT_FOUND	48Dh	TAPE	Read: Could not find BOW data Set
TAPE_READ_LAST_WRAP_DS_NOT_FOUND	48Eh	TAPE	Read: Could not find the last Data Set at end-of-wrap
TAPE_READ_BAD_CM_AND_BAD_FID	48Fh	TAPE	Read: Could not read FID
TAPE_SEEK_ISB_UNDERRUN	490h	TAPE	Seek: Hardware reports isb under-run error
TAPE_SEEK_ISB_SVO_FAIL	491h	TAPE	Seek: Hardware reports isb svo fail error
TAPE_SEEK_ISB_EOWRAP	492h	TAPE	Seek: Hardware reports isb eowrap error
TAPE_SEEK_ISB_UNKNOWN	493h	TAPE	Seek: Hardware reports isb un-known error
TAPE_READ_SERVO_OVERSHOOT	494h	TAPE	Read: Servo overshoot, past target
TAPE_BAD_CLEAN_CARTRIDGE	495h	TAPE	Tape: Bad cleaning cartridge
TAPE_OUT_OF_CLEAN_TAPE	496h	TAPE	Tape: Out of cleaning tape
TAPE_SEEKER_MISSING_DS	497h	TAPE	Read: Seeker missed data set buffer
TAPE_CHAN_HOC_GAIN_CALIB_FAILED	498h	TAPE	head offset gain calibration failed
TAPE_NULL_PTR_TP_LIST	499h	TAPE	Read: Detect Null pointer in tp_ds_list
TAPE_INVALID_PHYS_LP6	49Ah	TAPE	Tape: auto_load sequence for de-tecting invalid phys lp6
TAPE_ABORT_STATUS	49Bh	TAPE	Tape: abort status for command that has just been aborted
TAPE_HARD_READ_ERROR_RETRY_EXHAUSTED	49Ch	TAPE	Tape: could not recover data
TAPE_CHAN_BOTH_SERVO_HEADS_BAD	49Dh	TAPE	Tape: per tape servo gain calib: both channels failed
TAPE_CHAN_UPPER_SERVO_HEAD_BAD	49Eh	TAPE	Tape: per tape servo gain calib: upper channel failed
TAPE_CHAN_LOWER_SERVO_HEAD_BAD	49Fh	TAPE	Tape: per tape servo gain calib: lower channel failed
TAPE_SRV_FAIL_REPORT_EW	4A0h	TAPE	Write: WP fail to report early warn-ing at end of wrap.
TAPE_RED_ZONE_ERR_RETRY_EXHAUSTED	4A1h	TAPE	Tape: Red Zone Error retry ex-hausted
TAPE_APPEND_ON_TRACK_FAIL	4A2h	TAPE	Write: On track signal fail when try to detect the last DS for append
TAPE_SERVO_GAIN_CALIB_RETRY_FAIL	4A3h	TAPE	servo gain calib retry failed
TAPE_SERVO_GAIN_CALIB_RETRY_GOOD	4A4h	TAPE	servo gain calib retry good
TAPE_ON_TRACK_NEVER_ON	4A5h	TAPE	Read: On_Track signal is not ON
TAPE_WRITE_BOW_ON_TRACK_FAIL	4A6h	TAPE	Write: On track signal fail when try to start to write at BOW
TAPE_READ_SWITCH_WRONG_WRAP	4A7h	TAPE	Read: DSM commands to switch to opposite direction
TAPE_HARD_READ_ERROR_CORNER_RETRY_FAILED	4A8h	TAPE	Read: Failed to reread at corner
TAPE_READ_ILLEGAL_SWITCH_WRAP_IDLE_STATE	4A9h	TAPE	Read: Idle state, cannot switch wrap on the fly
TAPE_READ_ILLEGAL_SWITCH_WRAP_UNDERRU	4AAh	TAPE	Read: Underrrun state, cannot

Message	VSCQ	Type	Definition
N_STATE			switch wrap on the fly
TAPE_READ_SWITCH_WRAP_BAD_EOD_PAGE	4ABh	TAPE	Read: EOD must be valid
TAPE_READ_ILLEGAL_SWITCH_WRAP_BACKWARD_MODE	4ACh	TAPE	Read: Must be in forward mode
TAPE_CM_SUSPENDED_APPEND_WRITES_PAGE_FULL	4ADh	TAPE	
TAPE_READ_WRT_SUSPEND_MORE_THAN_4METERS	4Aeh	TAPE	
TAPE_READ_OVERSHOOT_RETRY_EXHAUSTED	4Afh	TAPE	
TAPE_READ_SEEK_LOST_POSITION	4B0h	TAPE	
TAPE_READ_NO_DATA_DETECTED	4B1h	TAPE	Cannot read any cwp
SRV_REEL_UNEXPECTED_MESSAGE_IN_ERROR_ABORT_TAPE_STATE	500h	Servo	Unexpected message received in error abort tape state
SRV_MOVETAPE_UNEXPECTED_MESSAGE_IN_RAMP_UP_STATE	501h	Servo	Unexpected message in ramp up state
SRV_MOVETAPE_UNEXPECTED_MESSAGE_IN_RAMP_DOWN_STATE	502h	Servo	Unexpected message in ramp down state
SRV_MOVETAPE_UNEXPECTED_MESSAGE_IN_RAMP_RESTART_STATE	503h	Servo	Unexpected message in ramp down restart state
SRV_MOVETAPE_UNEXPECTED_MESSAGE_IN_CRUISE_CONTROL_STATE	504h	Servo	Unexpected message received in cruise control state
SRV_ROTATE_UNEXPECTED_MESSAGE_IN_RAMP_UP_REEL_STATE	505h	Servo	Unexpected message received in ramp up reel state
SRV_ROTATE_UNEXPECTED_MESSAGE_IN_ROTATING_REEL_STATE	506h	Servo	Unexpected message received in rotating reel state
SRV_ROTATE_UNEXPECTED_MESSAGE_IN_RAMP_DOWN_REEL_STATE	507h	Servo	Unexpected message received in ramp down reel state
SRV_POSREEL_UNEXPECTED_MESSAGE_IN_MOVE_TO_POSITION_STATE	508h	Servo	
SRV_GOTO_LC_UNEXPECTED_MESSAGE_IN_RAMP_UP_STATE	509h	Servo	Unexpected message received in goto lc module in ramp up state
SRV_GOTO_LC_UNEXPECTED_MESSAGE_IN_WAIT_MARK_STATE	50Ah	Servo	Unexpected message received in goto lc module in wait mark state
SRV_GOTO_LC_UNEXPECTED_MESSAGE_IN_MARK_FOUND_STATE	50Bh	Servo	Unexpected message received in goto lc module in mark found state
SRV_GOTO_LC_UNEXPECTED_MESSAGE_IN_POSITION_STATE	50Ch	Servo	Unexpected message received in goto lc module in position tape state
SRV_REEL_UNEXPECTED_MESSAGE_IN_HOLD_STATE	50Dh	Servo	Unexpected message received in hold state.
SRV_REEL_UNEXPECTED_MESSAGE_IN_IDLE_STATE	50Eh	Servo	Unexpected message received in idle state
SRV_CMDPROC_REJ_PARM_LPOS_NOT_WITHIN_LP2_OR_LP6_IN_GOTO_TO_LPOS_VALID	50Fh	Servo	The LPOS selected for the GOTO_LPOS command is beyond the limits
SRV_CMDPROC_REJ_PARM_NOT_ENOUGH_TAPE_TO_RAMP_TO_LPOS_IN_GOTO_LPOS_PARAM_VALID	510h	Servo	The distance between the current position and the target LPOS is to short
SRV_CMDPROC_GOTO_LPOS_REJECTED_TAPE_NOT_STOPPED	511h	Servo	The tape was not stopped when this command was received
SRV_CMDPROC_GOTO_LPOS_REJECTED_LP1_LP6_NOT_SET	512h	Servo	The tape parameters were not set before issuing the GOTO_LPOS command.
SRV_MOVETAPE_TIMEOUT_CALCULATION_ERRO	513h	Servo	The calculation of a time out time in the movetape module calculated an

Message	VSCQ	Type	Definition
R			erroneous intermediate result
SRV_CALMEM_SET_TENSION_REJ_INVALID_STATE	514h	Servo	Set tension api call failed during startup
SRV_CALMEM_SET_TAPE_SPEED_REJ_INVALID_STATE	515h	Servo	Set tape speeds api call failed during startup
SRV_INDEX_MOTOR_INTERRUPT_NOT_DETECTED_AFTER_ROTATING_DRIVE_MOTOR	516h	Servo	Motor interrupt not detected after rotating drive motor
SRV_MOVETAPE_RAMPDOWN_API_FAILED_IN_TIMEOUT_HANDLER_IN_RAMP_UP_STATE	517h	Servo	An attempt to ramp down the tape failed after a timeout occured during ramp up
SRV_OFF_TRACK	518h	Servo	tracking servo detected off track event
SRV_NO_PES_FOUND	519h	Servo	no valid PES event
SRV_VCM_SHOCK_ERROR	51Ah	Servo	tracking servo detected shock vibration error
SRV_TRACKING_TARGET_OUTRANGE	51Bh	Servo	tracking servo detected unreachable track error
SRV_TRACKING_SAMPLE_ERROR	51Ch	Servo	tracking servo detected asic sample error
SRV_TRACKING_COARSE_MOVE_ERROR	51Dh	Servo	tracking servo detected coarse stepper is out of position
SRV_TRACKING_UPDATE_MEM_ERROR	51Eh	Servo	tracking servo detected PES memory failure
SRV_MOVETAPE_RAMPDOWN_API_FAILED_IN_TRACKING_CMD_FAILED_HANDLER_IN_RAMP_UP_STATE	51Fh	Servo	Rampdown api call failed/rejected when called from tracking command failed handler in the ramp up state
SRV_MOVETAPE_TRACKING_CMD_FAILED_IN_RAMP_UP_STATE	520h	Servo	Tracking command failed in ramp up state
SRV_CMDPROC_ROTATE_REEL_REJECTED_BECAUSE_CART_LOADED	521h	Servo	Rotate reel command rejected because cartridge is loaded and command is trying to rotate the cartridge reel
SRV_CMDPROC_ROTATE_REEL_REJECTED_BECAUSE_DRIVE_REEL_IS_OBSTRUCTED	522h	Servo	Rotate reel command rejected because reels are obstructed by tape or a cartridge.
SRV_CMDPROC_ROTATE_REEL_REJECTED_INVALID_REEL_SELECT	523h	Servo	Rotate reel command rejected because an invalid reel select was given
SRV_CMDPROC_SET_DRIVE_STATE_COMMAND_REJECTED_STATE_OUT_OF_RANGE	524h	Servo	Set drive state command rejected because the drive state is out of range.
SRV_STATEM_RECOVERY_COMMAND_REJECTED_DRIVE_IN_UNKNOWN_STATE	525h	Servo	Recovery command rejected, drive in unknown state.
SRV_TRKCNVT_MULTIPLY_ERROR_IN_TRACKING_CONVERT_FUNCTION	526h	Servo	Multiply error in tracking conversion function from ratio to dac
SRV_TRKCNVT_DIVIDE_ERROR_IN_TRACKING_CONVERT_FUNCTION	527h	Servo	Divide error in tracking conversion function from dac to ratio.
SRV_STATEM_AUTOLOAD_COMMAND_REJECTED_INVALID_STATE	528h	Servo	Command rejected since the drive state was invalid (out of range).
SRV_NOT_USED_OBSOLETE_2	529h	Servo	N/A
SRV_STATEM_PRE_EJECT_COMMAND_REJECTED_INVALID_STATE	52Ah	Servo	Command rejected since the drive state was invalid in pre-eject sequence
SRV_STATEM_PRE_EJECT_COMMAND_REJECTE	52Bh	Servo	Command rejected - drive in un-

Message	VSCQ	Type	Definition
D_DRIVE_IN_UNKNOWN_STATE			known state
SRV_STATEM_AUTOLOAD_COMMAND_REJECTED_UNKNOWN_STATE	52Ch	Servo	Command rejected - drive in unknown state
SRV_TRKCNVT_DAC_OUTPUT_EXCEEDED_LIMIT	52Dh	Servo	Calculated DAC tracking target greater than maximum input
SRV_TRKCNVT_DAC_OUTPUT_BELOW_MINIMUM_LIMIT	52Eh	Servo	Calculated DAC tracking target less than minimum input
SRV_STEP_HEAD_EXPECTING_BOTTOM_SENSOR_HIGH	52Fh	Servo	expecting SNS9 high
SRV_STEP_HEAD_EXPECTING_STOP_AFTER_BOTTOM_SENSOR_HIGH	530h	Servo	expecting SNS9 low
SRV_STEP_HEAD_EXPECTING_BOTTOM_SENSOR_LOW	531h	Servo	expecting stepper to halt after SNS9 high
SRV_STEP_HEAD_EXPECTING_STOP_AFTER_BOTTOM_SENSOR_LOW	532h	Servo	expecting stepper to halt after SNS9 low
SRV_SZA_INTERFACE_BUSY	533h	Servo	interface to SZA chip busy for too long
SRV_SZA_FUNCTION_ACTIVE	534h	Servo	SZA read or write already in progress
SRV_SZA_REGISTER_INVALID	535h	Servo	request to read invalid SZA register number
SRV_SZA_READ_COUNT_TOO_LARGE	536h	Servo	amount of SZA read data exceeds buffer size
SRV_SZA_WRITE_COUNT_TOO_LARGE	537h	Servo	amount of SZA write data exceeds buffer size
SRV_SZA_WRITE_DATA_INVALID	538h	Servo	SZA write data contains invalid reg or chip ID
SRV_REEL_CARTDITHER_API_CALL_FAILED_INVALID_STATE	539h	Servo	Call to cartDither api failed
SRV_SERIAL_EEPROM_FAILED	53Ah	Servo	
SRV_SRV_RTOS_INVALID_TASK_ID_SPECIFIED	53Bh	Servo	invalid task specified in rtos wrapper function.
SRV_MOTOR_POWER_FAIL_1	53Ch	Servo	no power to reel motor circuits on startup
SRV_MOTOR_POWER_FAIL_2	53Dh	Servo	no power to reel motor circuits after POR clear
SRV_MOTOR_POWER_FAIL_3	53Eh	Servo	no power to reel motor circuits after PF clear
SRV_MOTOR_POR_STUCK_1	53Fh	Servo	can't clear reel motor POR flag on startup
SRV_MOTOR_POR_STUCK_2	540h	Servo	can't clear reel motor POR flag after PF clear
SRV_MOTOR_PWR_FAIL	541h	Servo	can't clear reel motor power fail condition on startup
SRV_STATEM_AUTOLOAD_COMMAND_REJECTED_NO_CART_IN_DRIVE	542h	Servo	Autoload failed - no cartridge in drive.
SRV_SZA_LOAD_COMPLETION_FAILURE	543h	Servo	SZA load function did not complete in the allotted time
SRV_TAPE_CUT	544h	Servo	tape cut
SRV_MOVETAPE_ERROR_LP1_UNDERRUN_DURING_RAMP_UP	545h	Servo	LP1 Underrun during ramp up state
SRV_MOVETAPE_ERROR_LP6_OVERRUN_DURING_RAMP_UP	546h	Servo	LP6 overrun during ramp up
SRV_MOVETAPE_RAMP_DOWN_API_FAILED_DUR	547h	Servo	Ramp down api failed during error

Message	VSCQ	Type	Definition
ING_ERROR_HANDLING			handling
SRV_MOVETAPE_LP1_UNDERRUN_IN_CRUISE_CONTROL	548h	Servo	LP1 underrun during cruise control state.
SRV_MOVETAPE_LP6_OVERRUN_IN_CRUISE_CONTROL	549h	Servo	LP6 overrun in cruise control state.
SRV_CMDPROC_NO_CARTRIDGE_IN_DRIVE	54Ah	Servo	No cartridge in drive - reject attempt to load
SRV_STEP_HEAD_TRIGGERED_SENSORS_DURING_HEAD_STEPPING	54Bh	Servo	Top or bottom sensors for head stepper were triggered when they shouldn't have been.
SRV_STEP_HEAD_NOT_AT_REFERENCE_SENSOR	54Ch	Servo	
SRV_STEP_HEAD_COULD_NOT_FIND_PES_DURING_HEAD_CALIBRATION	54Dh	Servo	
SRV_STEP_HEAD_PES_CAPTURE_IS_BAD_DURING_HEAD_CALIBRATION	54Eh	Servo	
SRV_STEP_HEAD_INCORRECT_OFFSET_FROM_HEAD_CALIBRATION	54Fh	Servo	
SRV_ROTATE_ENABLEMOTOR_API_REJECT_BUSY	550h	Servo	Enable Motor API failed at beginning of Rotate command
SRV_EXCEED_LC_LIMIT	551h	Servo	exceed LC limit
SRV_RAD_COMP_ERR	552h	Servo	radius computation off
SRV_TAPE_SLACK	553h	Servo	tape slack
SRV_HIT_EOT	554h	Servo	hit EOT
SRV_HIT_PEOT	555h	Servo	hit PEOT
SRV_WATCH_DOG	556h	Servo	Watch Dog Timer Interrupt
SRV_EXCEPT_UNDEF_INSTR	557h	Servo	Undefined exception
SRV_EXCEPT_PREFECT	558h	Servo	Prefect exception
SRV_EXCEPT_MEMORY_ABORT	559h	Servo	Memory abort exception
SRV_EXCEPT_SOFTWARE_INTERRUPT	55Ah	Servo	Software interrupt exception
SRV_EXCEPT_EXCEPTION_CODE_OUT_OF_RANGE	55Bh	Servo	Software exception identifier out of range
SRV_GLOBAL_ERROR_STATE	55Ch	Servo	Firmware global error state
SRV_REEL_PHYSICAL_EOT_LIMIT_OVERRUN_IN_HOLD_STATE	55Dh	Servo	Physical eot limit overrun occured in hold state - tape control out of sync
SRV_REEL_PHYSICAL_BOT_LIMIT_UNDERRUN_IN_HOLD_STATE	55Eh	Servo	Physical bot limit underrun occured in hold state - tape control out of sync
SRV_REEL_LP1_LIMIT_UNDERRUN_IN_HOLD_STATE	55Fh	Servo	LP1 limit underrun in hold state - tape control out of sync
SRV_REEL_LP6_LIMIT_OVERRUN_IN_HOLD_STATE	560h	Servo	LP6 limit overrun in hold state - tape control out of sync
SRV_CMDPROC_PAST_EOT_REJ_INV_STATE_BETWEEN_EOT_AND_PEOT	561h	Servo	LPOS is past EOT based on ratiometric EOT detection
SRV_REEL_INVALID_TASK_FOR_MESSAGE_RESPONSE	562h	Servo	Sender id not valid for sending a message to
SRV_STATEM_SEQUENCER_STACK_OVERFLOW	563h	Servo	Sequencer control stack overflowed.
SRV_SEQ_STACK_UNDERFLOW	564h	Servo	Sequencer control stack underflowed.
SRV_CMDPROC_PAST_EOT_REJ_INV_STATE_EXCEEDING_PEOT	565h	Servo	Tape exceeds EOT per ratiometric calculation of position

Message	VSCQ	Type	Definition
SRV_MOVETAPE_UNEXPECTED_LPOS_NOTIFICATION_IN_RAMP_UP_STATE	566h	Servo	An LPOS notification occured during ramp up
SRV_MOVETAPE_UNRECOGNIZED_COMMAND_IN_RAMP_UP_STATE	567h	Servo	Unrecognized command detected at speed in ramp up state
SRV_STEP_HEAD_COULD_NOT_FIND_ANY_PES_DURING_HEAD_CALIBRATION	568h	Servo	
SRV_CMDPROC_MANUFACTURER_ID_NOT_AVAILABLE	569h	Servo	Manufacturer id not available
SRV_CMDPROC_LP1_NOT_AVAILABLE	56Ah	Servo	LP1 value not available
SRV_CMDPROC_MFR_DATA_NOT_AVAILABLE_TAPE_NOT_READ	56Bh	Servo	Manufacturer id not available.
SRV_CMDPROC_MFR_DATA_NOT_AVALIABLE_TAPE_NOT_READY	56Ch	Servo	Manufacturer data not available - tape is not load and threaded
SRV_SEQ_LOOP_UNDERRUN_CONDITION_IN_TABLE	56Dh	Servo	Loop in sequencer table detected an invalid condition of current state - command aborted
SRV_REEL_SETTENSION_API_FAILED_DURING_WRAP	56Eh	Servo	Settension API call failed during wrap tape operation
SRV_BAD_PES_VALUES	56Fh	Servo	
SRV_CMDPROC_HEAD_OFFSET_NOT_ZERO_IN_WRITE_MODE	570h	Servo	Head offset is not zero while writing.
SRV_EXCEPT_RETURN_FROM_RTOS	571h	Servo	Return from RTOS. Should never go here.
SRV_TRACKING_NEVER_CALLED	572h	Servo	= 1394
SRV_NEVER_SAW_SERVO_SIGNAL	573h	Servo	= 1395
SRV_SERVO_SIGNALS_NOT_WITHIN_ACQUIRING_WINDOW	574h	Servo	= 1396
SRV_FAILURE_DURING_TRACKING_RAMPING	575h	Servo	= 1397
SRV_FAILURE_DURING_TRACKING_SETTLING	576h	Servo	= 1398
SRV_FAILURE_DURING_TRACKING_PRE_TRACKING	577h	Servo	= 1399
SRV_FAILURE_DURING_READING	578h	Servo	= 1400
SRV_FAILURE_DURING_WRITING	579h	Servo	= 1401
SRV_MOVETAPE_HEAD_POS_OUT_OF_RANGE	57Ah	Servo	invalid head position from stepper task
SRV_CMDPROC_ERROR_CODE_NOT_SUPPORTED_FOR_SET_TRIGGER	57Bh	Servo	Error code not supported for set trigger command.
SRV_CLOSED_LOOP_STEPPER_TIMEOUT_ATTEMPTING_TO_FIND_PES	57Ch	Servo	
SRV_CMDPROC_SET_TRIGGER_REJECTED_TMUXSET_API_BUSY	57Dh	Servo	Set trigger argument not supported
SRV_SEQUENCER_LP1_UNDERRUN	57Eh	Servo	LP1 underrun alert received in sequencer during command processing
SRV_SEQUENCER_LP6_OVERRUN	57Fh	Servo	LP6 overrun alert received in sequencer during command processing
SRV_SEQUENCER_EOT_OVERRUN	580h	Servo	EOT overrun alert received in sequencer during command processing.
SRV_SEQUENCER_BOT_UNDERRUN	581h	Servo	BOT underrun alert received in sequencer during command processing.
SRV_SEQUENCER_UNKNOWN_ALERT_RECEIVED	582h	Servo	Unknown error alert received in se-

Message	VSCQ	Type	Definition
			quencer during command processing.
SRV_SZA_SIFT_COUNT_TOO_LARGE	583h	Servo	Sift values in READ SZA command exceed the number of samples
SRV_RTOS_TASK_ID_ERROR	584h	Servo	RTOS error - task id invalid
SRV_RTOS_NO_MEMORY_AVAILABLE	585h	Servo	RTOS error - no memory available
SRV_RTOS_MAILBOX_IN_USE	586h	Servo	RTOS error - mailbox in use
SRV_RTOS_ZERO_MESSAGE	587h	Servo	RTOS error - Zero message
SRV_RTOS_INVALID_SYSTEM_CALL	588h	Servo	RTOS error - Invalid system call
SRV_RTOS_NO_MESSAGE_PRESENT	589h	Servo	RTOS error - No message present
SRV_RTOS_QUEUE_ID_ERROR	58Ah	Servo	RTOS error, Queue id error
SRV_RTOS_QUEUE_FULL	58Bh	Servo	RTOS error, Queue full
SRV_STATEM_COMMAND_ABORTED_BY_EMERGENCY_EJECT	58Ch	Servo	Command aborted by emergency eject
SRV_EMERGENCY_EJECT_ABORT	58Dh	Servo	Command aborted by emergency abort
SRV_STEP_THREAD_TEST18_ERROR1	58Eh	Servo	slack couldn't be taken up
SRV_FINDZERO_INIT_API_REJECT	58Fh	Servo	findzero init servo findzero api reject
SRV_FINDZERO_ROUGH_RADIUS_API_REJECT	590h	Servo	findzero: rough radius servo api reject
SRV_FINDZERO_PRECISE_RADIUS	591h	Servo	findzero: precise radius servo api rejected
SRV_FINDZERO_COARSE_MOTION_API_REJECT	592h	Servo	findzero: coarse motion servo api rejected
SRV_MOVETAPE_RAMPDOWNTAPE_API_BUSY_REJECT_DURING_FINDZERO	593h	Servo	findzero rampdown api rejected during findzero operation
SRV_FINDZERO_NULL_FUNCTION_IN_TABLE	594h	Servo	null function pointer in table lookup
SRV_FINDZERO_INVALID_MESSAGE_RECEIVED	595h	Servo	invalid message received by reel task during findzero operation
SRV_CMDPROC_INVALID_DRIVE_STATE_ON_UNLOAD_CMD	596h	Servo	invalid drive state on unload command
SRV_CMDPROC_OUT_OF_RANGE_DRIVE_STATE_ON_UNLOAD_CMD	597h	Servo	Drive state is out of range.
SRV_CMDPROC_INVALID_DRIVE_STATE_ON_EJECT_CMD	598h	Servo	Eject command rejected, drive not in valid state.
SRV_CMDPROC_OUT_OF_RANGE_DRIVE_STATE_ON_EJECT_CMD	599h	Servo	Eject command rejected, drive state out of range.
SRV_FINDZERO_MOVETAPE_API_BUSY_REJECT	59Ah	Servo	Servo API function MoveTape() returned busy status when called from findzero
SRV_FINDZERO_POSITIONTAPE_API_FWD_BUSY_REJECT	59Bh	Servo	API call PositionTape forward failed when called from findzero
SRV_FINDZERO_POSITIONTAPE_API_REV_BUSY_REJECT	59Ch	Servo	API call PositionTape reverse failed when called from findzero
SRV_CMDPROC_CMD_REJECTED_DURING_INITIALIZATION	59Dh	Servo	Mechanical command received from scrambler while still initializing
SRV_CMDPROC_INVALID_DRIVE_STATE_ON_PARK_CMD	59Eh	Servo	Park command rejected, invalid state
SRV_CMDPROC_OUT_OF_RANGE_DRIVE_STATE_ON_PARK_CMD	59Fh	Servo	Park command rejected, out of range state
SRV_CMDPROC_INVALID_DRIVE_STATE_ON_UNPARK_CMD	5A0h	Servo	Unpark command rejected, invalid state

Message	VSCQ	Type	Definition
SRV_CMDPROC_OUT_OF_RANGE_DRIVE_STATE _ON_UNPARK_CMD	5A1h	Servo	Unpark command rejected, out of range state
SRV_CMDPROC_TAPE_IS_NOT_STOPPED	5A2h	Servo	Command rejected because tape is moving.
SRV_CMDPROC_INVALID_COMMAND_CHANGE_O F_DIRECTION	5A3h	Servo	Command rejected because tape is moving in the opposite direction
SRV_CAL_MOT1_MOVE	5A4h	Servo	Motor 1 (drive motor) moved during motor bias calibration
SRV_CAL_MOT2_MOVE	5A5h	Servo	Motor 2 (cartridge motor) moved during motor bias calibration
SRV_CAL_MOT1_STOP	5A6h	Servo	Motor 1 (drive motor) failed to move during motor bias calibration
SRV_CAL_MOT2_STOP	5A7h	Servo	Motor 2 (cartridge motor) failed to move during motor bias calibration
SRV_SEQ_RAMP_DOWN_COMPLETED_BEFORE_ HEAD_STEPPER_MOVE	5A8h	Servo	Ramp down completed before head stepper movement completed. Potential tape damage may have occured.
SRV_MOVETAPE_LPOS_NOTICATION_PASSED	5A9h	Servo	LPOS notification exceeded at set up time.
SRV_SEQ_INVALID_TRACKING_MODE_IN_REPOS ITION_TO_WRAP_COMMAND	5AAh	Servo	Invalid tracking mode parameter during reposition to wrap command
SRV_UNKNOWN_CMD	5ABh	Servo	Unknown command (out of range) in command processor
SRV_TESTBIT_INVALID_MODE_FOR_SET_MODE	5ACh	Servo	Invalid mode for test bit usage.
SRV_CLOSED_LOOP_STEPPER_FAILED_TO_FIND _PES	5ADh	Servo	Failed to find PES during closed loop head stepper positioning
SRV_STATEM_INVALID_STATE_AFTER_STEPPER _RECOVERY	5AEh	Servo	Invalid drive state after stepper recovery operation
SRV_HIT_EOT_YELLOW	5AFh	Servo	Servo entered yellow EOT zone in fwd direction
SRV_HIT_EOT_RED	5B0h	Servo	Servo entered red EOT zone in fw direction
SRV_SEQ_REGISTER_RESPONSE_OVERFLOW	5B1h	Servo	Too many responses were registered in the sequencer.
SRV_PES_AVG_FUNCTION_ACTIVE	5B2h	Servo	Read PES Average function already in progress
SRV_PES_AVG_READ_COUNT_TOO_LARGE	5B3h	Servo	Read count for PES Average function too large for buffer
SRV_SZA_SC_DATA_BUFFER_IN_USE	5B4h	Servo	SZA read command rejected because servo controller data buffer is in use.
SRV_PESAVG_SC_DATA_BUFFER_IN_USE	5B5h	Servo	PESAVG command rejected because servo controller data buffer is in use.
SRV_MOVETAPE_RAMP_UP_FAILED_REQUESTE D_SPEED_NOT_ACQUIRED	5B6h	Servo	Ramp up did not get to requested speed
SRV_MOVETAPE_SPEED_OUT_OF_RANGE_IN_G ET_CURRENT_SPEED	5B7h	Servo	Tape speed returned from get current speed out of range
SRV_TCNT_RUNAWAY	5B8h	Servo	ASIC TCNT register detects that the tape is running much higher than 4.15 meter/sec
SRV_CLOSED_LOOP_STEPPER_FAILED_TO_FIND _PES_GOING_BACKWARDS	5B9h	Servo	Closed loop stepper failed to find pes while in backwards mode
SRV_LPOS_SET_CANDIDATE_TAPE_NOT_MOVIN	5BAh	Servo	An attempt to enable a candidate

Message	VSCQ	Type	Definition
G			lpos notification entry was attempted while tape was not moving
SRV_LPOS_INVALID_TAPE_DIRECTION_WHEN_ENABLING_LIMITS	5BBh	Servo	When setting limits the direction of tape movement was not defined.
SRV_CMDPROC_INVALID_CALIB_DATA_FROM_FLASH	5BCh	Servo	Calibration data from flash has invalid values
SRV_CMDPROC_CALIB_DATA_OVERWRITTEN_BY_DEFAULTS	5BDh	Servo	Calibration data was overwritten by setting defaults
SRV_NEVER_SAW_SERVO_SIGNAL_DURING_BACKWARDS	5BEh	Servo	never saw servo signal during backwards tracking.
SRV_SERVO_SIGNALS_NOT_WITHIN_ACQUIRING_WINDOW_DURING_BACKWARDS	5BFh	Servo	servo signals not within acquiring window during backwards tracking.
SRV_FAILURE_DURING_TRACKING_BAND_LOCK	5C0h	Servo	failure during tracking band lock
SRV_FAILURE_DURING_TRACKING_BAND_LOCK_DURING_BACKWARDS	5C1h	Servo	failure during tracking band lock during backwards tracking.
SRV_FAILURE_DURING_TRACKING_RAMPING_DURING_BACKWARDS	5C2h	Servo	failure during tracking ramping during backwards tracking.
SRV_FAILURE_DURING_TRACKING_SETTLING_DURING_BACKWARDS	5C3h	Servo	failure during tracking settling during backwards tracking.
SRV_FAILURE_DURING_TRACKING_PRE_TRACKING_DURING_BACKWARDS	5C4h	Servo	failure during tracking pre tracking during backwards tracking.
SRV_FAILURE_DURING_READING_DURING_BACKWARDS	5C5h	Servo	failure during reading during backwards tracking.
SRV_FAILURE_DURING_WRITING_DURING_BACKWARDS	5C6h	Servo	failure during writing during backwards tracking.
SRV_REEL_UNEXPECTED_ERROR_DETECTED_MESSAGE_RECEIVED	5C7h	Servo	An asynchronous error detected message was received in a state that would normally not get such an error.
SRV_REEL_NULL_FUNCTION_IN_ERROR_MSG_TABLE	5C8h	Servo	A null function in the error handling function lookup was undefined.
SRV_REEL_INVALID_MESSAGE_RECEIVED_NOT_IN_TABLE	5C9h	Servo	A message that does not have an entry in the table look up was received
SRV_REEL_INVALID_STATE_VARIABLE_OUT_OF_RANGE	5CAh	Servo	The state variable is out of range.
SRV_TRACKING_FAILED_TO_TIMEOUT	5CBh	Servo	Tracking code fails to respond after failure to track.
SRV_MOVETAPE_UNEXPECTED_LPOS_RECIEVED_IN_CRUISE_CONTROL	5CCh	Servo	An LPOS reel notification was recieved in the cruise control state that was not expected for the active command.
SRV_CLEAN_SCRUB_LENGTH_MUST_BE_LESS_THAN_GOTO_LPOS	5CDh	Servo	Error because goto lpos - scrub lpos length is less than 0
SRV_MOVETAPE_TAPE_SPEED_NOT_GREATER_THAN_ZERO_AFTER_RAMP_UP	5CEh	Servo	After ramp up speed is not greater than zero
SRV_CMDPROC_INVALID_DRIVE_STATE_ON_CLEAN_CMD	5CFh	Servo	Cannot execute clean command at current drive state
SRV_CMDPROC_OUT_OF_RANGE_DRIVE_STATE_ON_CLEAN_CMD	5D0h	Servo	Unknown or out of range drive state for clean command
SRV_MOVETAPE_RAMP_DOWN_FAILED_AFTER_LPOS_HIT_IN_CRUISE_CONTROL	5D1h	Servo	After recieving LPOS notification to ramp down, the ramp down api failed in the cruise control state
SRV_CMDPROC_UNKNOWN_SOURCE_FOR_MESSAGE	5D2h	Servo	unknown 'sender' of message received in command processor task

Message	VSCQ	Type	Definition
SRV_MOVETAPE_TAPE_MOVEMENT_COMMANDS_ARE_INVALID_IN_CRUISE_CONTROL	5D3h	Servo	A tape movement command was received while tape was moving, this is not allowed.
SRV_HALL_SENSORS_TOO_HIGH	5D4h	Servo	The hall sensors with reference to the head stepper unit are locate too high. The head stepper unit needs to be relocated.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_IDLE	5D5h	Servo	Timeout during head stepper offset calibration idle.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_STARTING_SEARCH	5D6h	Servo	Timeout during head stepper offset calibration starting search.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_SEARCHING_FOR_PES	5D7h	Servo	Timeout during head stepper offset calibration searching for pes.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_FOUND_PES	5D8h	Servo	Timeout during head stepper offset calibration found pes.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_STOPPING_AFTER_FOUND_PES	5D9h	Servo	Timeout during head stepper offset calibration stopping after found pes.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_MOVING_UP_WITH_ADDED_HYSTERESIS	5DAh	Servo	Timeout during head stepper offset calibration moving up with added hysteresis.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_STOPPING_AFTER_ADDED_HYSTERESIS	5DBh	Servo	Timeout during head stepper offset calibration stopping after added hysteresis.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_CAPTURING_PES_SAMPLES	5DCh	Servo	Timeout during head stepper offset calibration capturing pes samples.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_STOPPING_AFTER_GOING_TO_NEW_OFFSET	5DDh	Servo	Timeout during head stepper offset calibration stopping after going to new offset.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_MOVING_UP_WITH_ADDED_HYSTERESIS_FOR_VERIFICATION	5DEh	Servo	Timeout during head stepper offset calibration moving up with added hysteresis for verification.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_VERIFYING_NEW_OFFSET	5DFh	Servo	Timeout during head stepper offset calibration verifying new offset.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_STOPPING_AFTER_GOING_TO_OFFSET	5E0h	Servo	Timeout during head stepper offset calibration stopping after going to offset.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_STOPPING_AFTER_REFERENCE_SENSOR_LOW	5E1h	Servo	Timeout during head stepper offset calibration stopping after reference sensor low.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_STOPPING_AFTER_REFERENCE_SENSOR_HIGH	5E2h	Servo	Timeout during head stepper offset calibration stopping after reference sensor high.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_STOPPING_AFTER_PES_FOUND	5E3h	Servo	Timeout during head stepper offset calibration stopping after pes found.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_DEALING_WITH_HYSTERESIS	5E4h	Servo	Timeout during head stepper offset calibration dealing with hysteresis.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_MOVE_UNTIL_REFERENCE_SENSOR_LOW	5E5h	Servo	Timeout during head stepper offset calibration move until reference sensor low.
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_TIMEOUT_DURING_MOVE_UNTIL_REFERENCE_SENSOR_HIGH	5E6h	Servo	Timeout during head stepper offset calibration move until reference sensor high.
SRV_LPOS_NEW_ESTIMATE_JUMPED_MORE_THAN_2_FROM_PREVIOUS_RELATIVE_LPOS	5E7h	Servo	New estimated LPOS should never jump more than 2 from previous relative_lpos.
SRV_CMDPROC_CMD_REJECT_DRIVE_MECH_ST	5E8h	Servo	Drive requires recovery command

Message	VSCQ	Type	Definition
UCK			to "unstuck" mechanics
SRV_CMDPROC_EMERGENCY_EJECT_IN_PROGRESS_ABORT_NOT_VALID	5E9h	Servo	Abort rejected because emergency eject was in progress
SRV_SEQ_INVALID_HIGHER_PRIORITY_COMMAND_RECEIVED	5EAh	Servo	A higher priority command was received from the command processor that was not a valid command.
SRV_INVALID_REEL_STATE_FOR_SET_RUN_TENSION_COMMAND	5EBh	Servo	Invalid reel state for set run tension command.
SRV_SEQ_NON_STANDARD_CARTRIDGE_RADIUS	5ECh	Servo	Calculated radius does not match possible radii for cartridges
SRV_TIMEOUT_DURING_HEAD_STEPPER_IDLE	5EDh	Servo	Timeout during head stepper idle.
SRV_TIMEOUT_DURING_HEAD_STEPPER_STARTING	5EEh	Servo	Timeout during head stepper starting.
SRV_TIMEOUT_DURING_HEAD_STEPPER_MOVING_TO_POSITION	5EFh	Servo	Timeout during head stepper moving to position.
SRV_TIMEOUT_DURING_HEAD_STEPPER_STOPPING_AFTER_MOVING_TO_POSITION	5F0h	Servo	Timeout during head stepper stopping after moving to position.
SRV_TIMEOUT_DURING_HEAD_STEPPER_MOVING_UP_WITH_ADDED_HYSTERESIS	5F1h	Servo	Timeout during head stepper moving up with added hysteresis.
SRV_TIMEOUT_DURING_HEAD_STEPPER_VALIDATING_PES	5F2h	Servo	Timeout during head stepper validating pes.
SRV_TIMEOUT_DURING_HEAD_STEPPER_MOVE_UNTIL_REFERENCE_SENSOR_HIGH	5F3h	Servo	Timeout during head stepper move until reference sensor high.
SRV_TIMEOUT_DURING_HEAD_STEPPER_MOVE_UNTIL_REFERENCE_SENSOR_LOW	5F4h	Servo	Timeout during head stepper move until reference sensor low.
SRV_TIMEOUT_DURING_HEAD_STEPPER_STOPPING_AFTER_REFERENCE_SENSOR_HIGH	5F5h	Servo	Timeout during head stepper stopping after reference sensor high.
SRV_TIMEOUT_DURING_HEAD_STEPPER_STOPPING_AFTER_REFERENCE_SENSOR_LOW	5F6h	Servo	Timeout during head stepper stopping after reference sensor low.
SRV_TIMEOUT_DURING_HEAD_STEPPER_SEACHING_FOR_SERVO_BUNDLE	5F7h	Servo	Timeout during head stepper seaching for servo bundle.
SRV_TIMEOUT_DURING_HEAD_STEPPER_RETURNING_FROM_SEARCHING_FOR_SERVO_BUNDLE	5F8h	Servo	Timeout during head stepper returning from searching for servo bundle.
SRV_TIMEOUT_DURING_HEAD_STEPPER_SEARCHING_FOR_SERVO_BUNDLE_IN_OTHER_DIRECTION	5F9h	Servo	Timeout during head stepper searching for servo bundle in other direction.
SRV_TIMEOUT_DURING_HEAD_STEPPER_RETURNING_FROM_SEARCHING_FOR_SERVO_BUNDLE_IN_OTHER_DIRECTION	5FAh	Servo	Timeout during head stepper returning from searching for servo bundle in other direction.
SRV_TIMEOUT_DURING_HEAD_STEPPER_STOPPING_AFTER_FAILING_SEACH_FOR_SERVO_BUNDLE	5FBh	Servo	Timeout during head stepper stopping after failing seach for servo bundle.
SRV_TIMEOUT_DURING_HEAD_STEPPER_STOPPING_BEFORE_SEARCHING_FOR_SERVO_BUNDLE_IN_OTHER_DIRECTION	5FCh	Servo	Timeout during head stepper stopping before searching for servo bundle in other direction.
SRV_TIMEOUT_DURING_HEAD_STEPPER_HYSTERESIS_BEFORE_SEARCHING_FOR_SERVO_BUNDLE_IN_OTHER_DIRECTION	5FDh	Servo	Timeout during head stepper hysteresis before searching for servo bundle in other direction.
SRV_TIMEOUT_DURING_HEAD_STEPPER_STOPPING_AFTER_FAILING_SEACH_FOR_SERVO_BUNDLE_IN_OTHER_DIRECTION	5FEh	Servo	Timeout during head stepper stopping after failing seach for servo bundle in other direction.
SRV_SEQ_INCORRECT_SERVO_BAND_BEFORE_TRACKING	5FFh	Servo	Servo band not at target servo band
SRV_SELF_EXCEPTION_BUF_OVERFLOW	620h	Servo	Overflow in self_isr has occured.

Message	VSCQ	Type	Definition
SRV_SEQ_SERVO_BAND_VALIDATION_FAILED_AND_RECOVERED_ON_RETRY	621h	Servo	Exception: Servo band found does not match servo band requested on first attempt
SRV_SEQ_HEAD_POSITION_REQUESTED_OUT_OF_RANGE	622h	Servo	Servo head position out of range in servo band validation
SRV_SEQ_SERVO_BAND_VALIDATION_FAILED_CANNOT_COMPUTE_SERVO_BAND_NUMBER	623h	Servo	Servo code could not compute the servo band number
SRV_SELF_FIQ_SERVO_ERROR_DATA	624h	Servo	FIQ Servo code generated error with data
SRV_POWER_ON_SELF_TEST_FAILED	625h	Servo	Power on self test failed during power up
SRV_INVALID_ERROR_ALERT_TRANSLATION_TO_MESSAGE_STATUS_TYPE	626h	Servo	Alert type is invalid for translation to error code (MESSAGE_STATUS_T).
SRV_SMACHINE_RADIUS_CALCULATION_RETRIED_SUCCESSFULLY	627h	Servo	Radius calculation failed to validate on first attempt but succeeded on retry
SRV_CMDPROC_HEAD_OFFSET_CALIBRATION_REJECTED_TAPE_NOT_MOVING	628h	Servo	Head offset calibration is not valid if tape is not moving.
SRV_MOVETAPE_LP6_OVERRUN	629h	Servo	LP6 overrun detected by RTOS
SRV_MOVETAPE_LP1_UNDERRUN	62Ah	Servo	LP1 underrun detected by RTOS
SRV_MOVETAPE_EOT_OVERRUN	62Bh	Servo	EOT overrun detected by encoder interrupt
SRV_MOVETAPE_BOT_UNDERRUN	62Ch	Servo	BOT underrun detected by encoder interrupt
SRV_CMDPROC_INVALID_DRIVE_STATE_ON_RAMP_CMD	62Dh	Servo	Ramp cannot execute at current drive state
SRV_CMDPROC_OUT_OF_RANGE_DRIVE_STATE_ON_RAMP_CMD	62Eh	Servo	Ramp cannot execute at undefined drive state
SRV_ATTEMPTING_TO_FIND_PES_RETRY	62Fh	Servo	Head stepper module is going to 'look' for pes after a delay.
SRV_SEQ_TARGET_LPOS_NOT_BEHIND_CURRENT_POSITION	630h	Servo	Reject reposition command, target is not 'behind' current lpos position
SRV_SEQ_TARGET_LPOS_EXCEEDED_IN_REPOSITION_COMMAND	631h	Servo	Command failed LPOS target past notification point.
SRV_CART_MEMORY_LP1_AND_WP_CALC_LP1_NOT_WITHIN_TOLERANCE	632h	Servo	Cartridge memory LP1 value isn't within tolerance of the Whirlpool calculated LP1.
SRV_CM_CALC_CART_TYPE_DOES_NOT_MATCH_RADIUS_CALC_CART_TYPE	633h	Servo	Cartridge type derived from mic LP1 and LP6 doesn't match cartridge type calculated from radius wrap.
SRV_CM_LP1_AND_LP6_NOT_WITHIN_LTO_SPEC	634h	Servo	Cartridge memory LP1 and LP6 values don't fall within LTO specification.
SRV_SEQ_INVALID_LPOS_DISTANCE_IN_CALCULATE_OPTIMAL_BACKWARD_SPEED	635h	Servo	Invalid lpos distance (negative) calculated in reposition command
SRV_LPOS_BOT_UNDERRUN	636h	Servo	Whirlpool relative LP1 (972) underrun.
SRV_MOVETAPE_ERROR_REL_LP1_UNDERRUN_DURING_RAMP_UP	637h	Servo	Exceded BOT, emergency ramp down if going reverse
SRV_MOVETAPE_REL_LP1_UNDERRUN	638h	Servo	Relative LP1 underrun detected by RTOS
SRV_MOVETAPE_REL_LP1_UNDERRUN_IN_CRUISE_CONTROL	639h	Servo	

Message	VSCQ	Type	Definition
SRV_REEL_REL_LP1_LIMIT_UNDERRUN_IN_HOLD_STATE	63Ah	Servo	Relative LP1 limit underrun in hold state, tape control out of sync
SRV_CMDPROC_COMMAND_INVALID_SEQUENCE	63Bh	Servo	Recovery commands are for internal use only and should not be executed from the scrambler
SRV_SEQ_UNEXPECTED_COMMAND_RECEIVED_DURING_ACTIVE_MECHANICAL_COMMAND	63Ch	Servo	A command was received from the command processor during processing of a mechanical commmand
SRV_SEQ_COMMAND_RECEIVED_DURING_ERROR_HANDLING	63Dh	Servo	A command was received from the command processor during error recovery. This may have occurred if an asynchronous error occurred simultaneous to a new command from the Controller.
SRV_POST_REGISTER_FAILED	63Eh	Servo	POST register test failed
SRV_NOT_USED	63Fh	Servo	End of this SRV series
SCSI_SAPI_REQUEST_TIMEOUT	640h	SCSI	
CM_BAD_APP_SPEC	700h	Medium Auxiliary Memory	Application Specific
CM_BAD_CM_MANUF_INFO	701h	Medium Auxiliary Memory	CM Manufacturer's Information
CM_BAD_WRITE_PROTECT	702h	Medium Auxiliary Memory	CM Write Protect
CM_BAD_PROT_PAGE_TBL	703h	Medium Auxiliary Memory	CM Protected Page Table
CM_BAD_CART_MANUF_INFO	704h	Medium Auxiliary Memory	Cartridge Manufacturer's Information
CM_BAD_MEDIA_MANUF_INFO	705h	Medium Auxiliary Memory	Media Manufacturer's Information
CM_BAD_DRIVE_MANUF_SUPPORT	706h	Medium Auxiliary Memory	Drive Manufacturer's Support
CM_BAD_UNPROT_PAGE_TBL	710h	Medium Auxiliary Memory	CM Unprotected Page Table
CM_BAD_INITIALIZATION	711h	Medium Auxiliary Memory	Initialisation Data
CM_BAD_WRITE_PASS	712h	Medium Auxiliary Memory	Tape Write Pass
CM_BAD_TAPE_DIR	713h	Medium Auxiliary Memory	Tape Directory
CM_BAD_EOD_INFO	714h	Medium Auxiliary Memory	EOD Information
CM_BAD_CART_STATUS	715h	Medium Auxiliary Memory	Cartridge Status & Tape Alert Flags
CM_BAD_MECHANISM_RELATED	716h	Medium Auxiliary Memory	Mechanism Related
CM_BAD_SUSPEND_APPEND	717h	Medium Auxiliary Memory	Suspended Append Writes
CM_BAD_USAGE_INFO_0	718h	Medium Auxiliary Memory	Usage Information 0
CM_BAD_USAGE_INFO_1	719h	Medium Auxiliary Memory	Usage Information 1
CM_BAD_USAGE_INFO_2	71Ah	Medium Auxiliary Memory	Usage Information 2
CM_BAD_USAGE_INFO_3	71Bh	Medium Auxiliary Memory	Usage Information 3

Message	VSCQ	Type	Definition
CM_BAD_CLEAN_USAGE_0	71Ch	Medium Auxiliary Memory	Cleaning Usage 0
CM_BAD_CLEAN_USAGE_1	71Dh	Medium Auxiliary Memory	Cleaning Usage 1
CM_BAD_CLEAN_USAGE_2	71Eh	Medium Auxiliary Memory	Cleaning Usage 2
CM_BAD_CLEAN_USAGE_3	71Fh	Medium Auxiliary Memory	Cleaning Usage 3
EEP_BAD_PROT_PAGE_TBL	720h	Medium Auxiliary Memory	EEPROM Protected Page Table
EEP_BAD_DRIVE_CONFIG_INFO	721h	Medium Auxiliary Memory	Drive ID / Configuration Info
EEP_BAD_FW_VER_0	728h	Medium Auxiliary Memory	Firmware Version Info 0
EEP_BAD_FW_VER_1	729h	Medium Auxiliary Memory	Firmware Version Info 1
EEP_BAD_FW_VER_2	72Ah	Medium Auxiliary Memory	Firmware Version Info 2
EEP_BAD_FW_VER_3	72Bh	Medium Auxiliary Memory	Firmware Version Info 3
EEP_BAD_FW_VER_4	72Ch	Medium Auxiliary Memory	Firmware Version Info 4
EEP_BAD_FW_VER_5	72Dh	Medium Auxiliary Memory	Firmware Version Info 5
EEP_BAD_FW_VER_6	72Eh	Medium Auxiliary Memory	Firmware Version Info 6
EEP_BAD_FW_VER_7	72Fh	Medium Auxiliary Memory	Firmware Version Info 7
EEP_BAD_UNPROT_PAGE_TBL	730h	Medium Auxiliary Memory	EEPROM Unprotected Page Table
EEP_BAD_SWITCH_SETTINGS	731h	Medium Auxiliary Memory	Switch Settings
EEP_BAD_DEBUG_FLAGS	732h	Medium Auxiliary Memory	Debug Flags
EEP_BAD_CART_STAT_0	734h	Medium Auxiliary Memory	Cartridge Status & Tape Alert Flags 0
EEP_BAD_CART_STAT_1	735h	Medium Auxiliary Memory	Cartridge Status & Tape Alert Flags 1
EEP_BAD_CART_STAT_2	736h	Medium Auxiliary Memory	Cartridge Status & Tape Alert Flags 2
EEP_BAD_CART_STAT_3	737h	Medium Auxiliary Memory	Cartridge Status & Tape Alert Flags 3
EEP_BAD_CART_USAGE_0	738h	Medium Auxiliary Memory	Cartridge Usage Info 0
EEP_BAD_CART_USAGE_1	739h	Medium Auxiliary Memory	Cartridge Usage Info 1
EEP_BAD_CART_USAGE_2	73Ah	Medium Auxiliary Memory	Cartridge Usage Info 2
EEP_BAD_CART_USAGE_3	73Bh	Medium Auxiliary Memory	Cartridge Usage Info 3
EEP_BAD_DRIVE_USAGE_0	73Ch	Medium Auxiliary Memory	Drive Usage Info 0
EEP_BAD_DRIVE_USAGE_1	73Dh	Medium Auxiliary Memory	Drive Usage Info 1

Message	VSCQ	Type	Definition
EEP_BAD_DRIVE_USAGE_2	73Eh	Medium Auxiliary Memory	Drive Usage Info 2
EEP_BAD_DRIVE_USAGE_3	73Fh	Medium Auxiliary Memory	Drive Usage Info 3
EEP_BAD_ERROR_EVENT_00	740h	Medium Auxiliary Memory	Error Event 00
EEP_BAD_ERROR_EVENT_01	741h	Medium Auxiliary Memory	Error Event 01
EEP_BAD_ERROR_EVENT_02	742h	Medium Auxiliary Memory	Error Event 02
EEP_BAD_ERROR_EVENT_03	743h	Medium Auxiliary Memory	Error Event 03
EEP_BAD_ERROR_EVENT_04	744h	Medium Auxiliary Memory	Error Event 04
EEP_BAD_ERROR_EVENT_05	745h	Medium Auxiliary Memory	Error Event 05
EEP_BAD_ERROR_EVENT_06	746h	Medium Auxiliary Memory	Error Event 06
EEP_BAD_ERROR_EVENT_07	747h	Medium Auxiliary Memory	Error Event 07
EEP_BAD_ERROR_EVENT_08	748h	Medium Auxiliary Memory	Error Event 08
EEP_BAD_ERROR_EVENT_09	749h	Medium Auxiliary Memory	Error Event 09
EEP_BAD_ERROR_EVENT_10	74Ah	Medium Auxiliary Memory	Error Event 10
EEP_BAD_ERROR_EVENT_11	74Bh	Medium Auxiliary Memory	Error Event 11
EEP_BAD_ERROR_EVENT_12	74Ch	Medium Auxiliary Memory	Error Event 12
EEP_BAD_ERROR_EVENT_13	74Dh	Medium Auxiliary Memory	Error Event 13
EEP_BAD_ERROR_EVENT_14	74Eh	Medium Auxiliary Memory	Error Event 14
EEP_BAD_ERROR_EVENT_15	74Fh	Medium Auxiliary Memory	Error Event 15
EEP_BAD_EXCEPTION_EVENT_00	750h	Medium Auxiliary Memory	Exception Event 00
EEP_BAD_EXCEPTION_EVENT_01	751h	Medium Auxiliary Memory	Exception Event 01
EEP_BAD_EXCEPTION_EVENT_02	752h	Medium Auxiliary Memory	Exception Event 02
EEP_BAD_EXCEPTION_EVENT_03	753h	Medium Auxiliary Memory	Exception Event 03
EEP_BAD_EXCEPTION_EVENT_04	754h	Medium Auxiliary Memory	Exception Event 04
EEP_BAD_EXCEPTION_EVENT_05	755h	Medium Auxiliary Memory	Exception Event 05
EEP_BAD_EXCEPTION_EVENT_06	756h	Medium Auxiliary Memory	Exception Event 06
EEP_BAD_EXCEPTION_EVENT_07	757h	Medium Auxiliary Memory	Exception Event 07
EEP_BAD_EXCEPTION_EVENT_08	758h	Medium Auxiliary Memory	Exception Event 08

Message	VSCQ	Type	Definition
EEP_BAD_EXCEPTION_EVENT_09	759h	Medium Auxiliary Memory	Exception Event 09
EEP_BAD_EXCEPTION_EVENT_10	75Ah	Medium Auxiliary Memory	Exception Event 10
EEP_BAD_EXCEPTION_EVENT_11	75Bh	Medium Auxiliary Memory	Exception Event 11
EEP_BAD_EXCEPTION_EVENT_12	75Ch	Medium Auxiliary Memory	Exception Event 12
EEP_BAD_EXCEPTION_EVENT_13	75Dh	Medium Auxiliary Memory	Exception Event 13
EEP_BAD_EXCEPTION_EVENT_14	75Eh	Medium Auxiliary Memory	Exception Event 14
EEP_BAD_EXCEPTION_EVENT_15	75Fh	Medium Auxiliary Memory	Exception Event 15
EEP_BAD_POR_COUNT	760h	Medium Auxiliary Memory	Power On Reset Count
EEP_BAD_RETRY_HISTORY	761h	Medium Auxiliary Memory	Retry History
EEP_BAD_APP_SPEC	76Ah	Medium Auxiliary Memory	Application Specific
SCSI_SC_TRANSFER_DONE_NO_PCMD	780h	SCSI	SCSI received SC_TRANSFER_DONE but pCmd is NULL
SCSI_SC_COMPLETE_DONE_NO_PCMD	781h	SCSI	SCSI received SC_COMPLETE_DONE but pCmd is NULL
SCSI_FE_QUEUE_TOO_MANY_PCMDS	782h	SCSI	SCSI FE traps excessive number of pCmds in the queue
SCSI_NULL_SDPORT_DB_CHANGED	783h	SCSI	Database change – NULL SUPPORT pointer
SCSI_HAPI_INVOKE_CALLBACK_FAILED	784h	SCSI	HAPI DMA failed to invoke FC call-back
SCSI_FAILED_TO_REMOVE_IID	785h	SCSI	Failed to remove/log out the initiator.
SCSI_FE_RETRY_FUNCTION_POINTER_IS_NULL	786h	SCSI	FE Retry dispatch has a null pointer
SCSI_WP_VERSION_NOT_AVAILABLE	787h	SCSI	Whirpool Version Number Not Available
SCSI_WP_DATE_NOT_AVAILABLE	788h	SCSI	Whirpool Build Date Not Available
SCSI_EARLY_EXIT_FAILED	789h	SCSI	
SCSI_EARLY_EXIT_FAILED_SIZE	78Ah	SCSI	
SCSI_EARLY_EXIT_FAILED_BOR	78Bh	SCSI	
SCSI_STS_BUSY_TRANS_ID_ALLOCATION_FAILURE	78Ch	SCSI	
SCSI_STS_BUSY_CA_ACTIVE	78Dh	SCSI	
SCSI_STS_BUSY_CA_OR_ACA_ACTIVE	78Eh	SCSI	
SCSI_STS_BUSY_NO_DISC_PRIV_AND_NEED_TO_RUN_NOW	78Fh	SCSI	
SCSI_STS_BUSY_IMMED_NEED_TO_RUN_NOW_AND_BE_BUSY	790h	SCSI	
SCSI_STS_BUSY_LIB_SVC_RESP_INVALID_ID	791h	SCSI	
SCSI_CANNOT_APPEND_LIB_IID_FREE_Q	792h	SCSI	
SCSI_CANNOT_REMOVE_LIB_IID_FREE_Q	793h	SCSI	
SCSI_CANNOT_ADD_LIB_IID_LRU_Q	794h	SCSI	
SCSI_CANNOT_REMOVE_LIB_IID_LRU_Q	795h	SCSI	
SCSI_CANNOT_UPDATE_LIB_IID_LRU_Q	796h	SCSI	

Message	VSCQ	Type	Definition
SCSI_STS_BUSY_IMMED_LIB_CMD_AND_BE_BSY	797h	SCSI	
SCSI_INVALID_TRANSPORT_COUNT	798h	SCSI	
SCSI_STATUS_DIAG_DMA_CONTROLLER_TIMEOUT	799h	SCSI	
SCSI_STATUS_DIAG_FPGA_VERSION_ERROR	79Ah	SCSI	
SCSI_STATUS_DIAG_FC_SDRAM_PARAMETER_MISMATCH	79Bh	SCSI	
SCSI_STATUS_DIAG_RB_PARAMETER_MISMATCH	79Ch	SCSI	
SCSI_INVALID_COMMAND_REFERENCE_NUMBER	79Dh	SCSI	
SCSI_UA_INITIATOR_LOGGED_OUT	79Eh	SCSI	
SCSI_FCP_INVALID_PORT_NUMBER_ENABLE_PORT	79Fh	SCSI	
SCSI_FCP_INVALID_PORT_NUMBER_ID_CHANGE_REQUEST	7A0h	SCSI	
SCSI_FCP_INVALID_PORT_NUMBER_DISABLE_PORT	7A1h	SCSI	
DSM_READ_DSN_OUT_OF_SEQUENCE	8C0h	Data set manager	
DSM_SCSI_COMMAND_ABORTED	8C1h	Data set manager	
DSM_BE_WR_EOWS_IN_ODD_SECTION	8C2h	Data set manager	
DSM_LOCATE_DONE_BUT_NOT_AT_TARGET	8C3h	Data set manager	
DSM_MIC_UPDATE_TAPE_DIR_BUILD_FAILED	8C4h	Data set manager	
DSM_BE_WR_OUTSTANDING_DS_COUNT_CANT_GO_NEGATIVE	8C5h	Data set manager	
DSM_BE_READ_STOP_MISSING_DS	8C6h	Data set manager	
DSM_FAILURE_OCCURRED_WITH_GOOD_STATUS	8C7h	Data set manager	
DSM_LOCATE_TERMINATED_WITH_GOOD_STATUS	8C8h	Data set manager	
DSM_DEGRADED_SPACE_LOCATE	8C9h	Data set manager	
DSM_CANT_CORRECT_INIT_PAGE_AWAY_FROM_BOT	8CAh	Data set manager	
DSM_DCA_PUT_REREAD_RECOVERED_FAILED	8CBh	Data set manager	
DSM_RECEIVED_INVALID_DS_DATA	8CCh	Data set manager	
DSM RECEIVED_INVALID_DS_DONE	8CDh	Data set manager	
DSM_RECEIVED_INVALID_DS_EMPTY	8CEh	Data set manager	
DSM_CMD_LIST_RECVD_DONE_WHILE_PREVENTED	8CFh	Data set manager	
DSM_MIC_Q_CANT_PREVENT_LIST_NOT_EMPTY	8D0h	Data set manager	
DSM_RB_NOT_EMPTY_AFTER_FLUSH	8D1h	Data set manager	
DSM_CMPR_NO_DS_TO_FLUSH	8D2h	Data set manager	
SRV_POST_MEMORY_FAILED	900h	Servo	Post memory test failed
SRV_POST_DIVIDER_FAILED	901h	Servo	POST hardware divider test failed
SRV_POST_TIMESTAMP_FAILED	902h	Servo	Post timestamp incrementing test failed
SRV_SEQ_INVALID_DRIVE_STATE_AT_UNLOAD	903h	Servo	Sequencer received a load command when drive was parked. This should never happen.
SRV_CMDPROC_INVALID_STATE_FOR_LOAD	904h	Servo	Command processor rejects load command because drive is in parked
SRV_POST_INTERRUPT_FAILED_TIMER1_INTERR	905h	Servo	Unexpected timer1 interrupt oc-

Message	VSCQ	Type	Definition
UPT_UNEXPECTEDLY_OCCURRED			cured during POST
SRV_POST_INTERRUPT_FAILED_TIMER2_INTERRUPT_UNEXPECTEDLY_OCCURRED	906h	Servo	Unexpected timer2 interrupt occured during POST
SRV_POST_INTERRUPT_FAILED_PARPORT_INTERRUPT_UNEXPECTEDLY_OCCURRED	907h	Servo	Unexpected parport interrupt occured during POST
SRV_POST_INTERRUPT_FAILED_TIMER1	908h	Servo	POST interrupt test failed at timer1
SRV_POST_INTERRUPT_FAILED_TIMER2	909h	Servo	POST interrupt test failed at timer2
SRV_POST_INTERRUPT_FAILED_WATCHDOG	90Ah	Servo	POST interrupt test failed at watchdog
SRV_POST_INTERRUPT_FAILED_SELF	90Bh	Servo	POST interrupt test failed at self irq
SRV_POST_INTERRUPT_FAILED_PARPORT	90Ch	Servo	POST interrupt test failed at parallel port
SRV_POST_INTERRUPT_FAILED_RTC	90Dh	Servo	POST interrupt test failed at rtc
SRV_POST_INTERRUPT_FAILED_UART_TRANSMIT	90Eh	Servo	POST interrupt test failed at uart transmit
SRV_POST_INTERRUPT_FAILED_MOTOR_AND_SERVO_FIQ	90Fh	Servo	POST interrupt test failed at servo fiq and servo fiq
SRV_CANNOT_CALCULATE_SERVO_BAND_ID_BECAUSE_BOTH_SERVOS_MISSING	910h	Servo	Both servo signals are missing.
SRV_CANNOT_CALCULATE_SERVO_BAND_ID_BECAUSE_BOTTOM_SERVO_MISSING	911h	Servo	Bottom servo signal is missing.
SRV_CANNOT_CALCULATE_SERVO_BAND_ID_BECAUSE_TOP_SERVO_MISSING	912h	Servo	Top servo signal is missing.
SRV_CANNOT_CALCULATE_SERVO_BAND_ID_BECAUSE_SOME_SERVO_MISSING	913h	Servo	Signal status not updated in time or wrong.
SRV_CLOSED_LOOP_STEPPER_TOO_MANY_RETRIES_DUE_TO_BOTH_SERVOS_MARGINAL	914h	Servo	Too many retries due to both servos marginal.
SRV_CMDPROC_HEAD_POS_CLOSED_LOOP_REJECTED_TAPE_NOT_MOVING	915h	Servo	Tape needs to be moving for head pos closed loop.
SRV_CMDPROC_INVALID_DRIVE_STATE_ON_REWRAP_CMD	916h	Servo	Drive state has to be wrapped, bot, or beyond bot for rewrap command
SRV_CMDPROC_OUT_OF_RANGE_DRIVE_STATE_ON_REWRAP_CMD	917h		Illegal drive state
SRV_STATEM_REWRAP_COMMAND_REJECTED_INVALID_STATE	918h	Servo	Command rejected since the drive state was invalid (out of range).
SRV_CMDPROC_CMD_REJECT_SEQUENCER_BUSY_AND_BUFFER_FULL	919h	Servo	Command rejected since the sequencer was processing an error and the polled buffer already had a message
SRV_CANNOT_INSERT_INTO_LPOS_NOTIFY_TABLE_UNTIL_SCR_AND_WP_FOUND_LP1	91Ah	Servo	LPOS values in the notification table are dependent on CM_LP1 and WP_LP1
SRV_LPOS_ROLLOVER_DETECTED_FROM_CM_PHYS_LP1	91Bh	Servo	Calc phy LP7 from CM phys LP1 is greater then LTO spec
SRV_LPOS_ROLLOVER_DETECTED_FROM_WP_CALC_PHYS_LP1	91Ch	Servo	Calc phy LP7 from WP calc phys LP1 is greater then LTO spec
SRV_LPOS_TOP_SERVO_AND_BOTTOM_SERVO_CALC_LP1_NOT_WITHIN_TOLERANCE	91Dh	Servo	The LP1 value calc for top servo didn't match the LP1 value calc for the bottom servo
SRV_REEL_MOT_PWR_FAIL_DETECTED	91Eh	Servo	12 volt power reset detected
SRV_REEL_MOT_EXCESSIVE_CURRENT_DEMAND_DETECTED	91Fh	Servo	Excessive current detected on motor
SRV_FINDZERO_TIME_OUT	920h	Servo	Time out occured waiting for servo response, state is in extended

Message	VSCQ	Type	Definition
			status word
SRV_FINDZERO_STATE_VARIABLE_OUT_OF_RANGE	921h	Servo	Find zero wrap state variable out of range
SRV_FINDZERO_COARSE_OR_APPROACHING	922h	Servo	Find zero wrap coarse or approaching api rejected call
SRV_FINDZERO_INDEX_SETUP_API_REJECT	923h	Servo	Find zero wrap index setup api rejected call
SRV_FINDZERO_INDEX_HOME_API_REJECT	924h	Servo	Find zero wrap index home api rejected call
SRV_FINDZERO_HOME_DRIVE_REEL_API_REJECT	925h	Servo	Find zero wrap home drive reel api rejected call
SRV_FINDZERO_APPROACHING_API_REJECT	926h	Servo	Find zero wrap approaching zero api rejected call
SRV_FINDZERO_TOO_MANY_RETRIES_AFTER_COARSE_MOTION	927h	Servo	Find zero wrap coarse exceeded coarse motion retries
SRV_FINDZERO_TOO_MANY_RETRIES_AFTER_COMPLETE	928h	Servo	Find zero wrap retries exceeded after completion
SRV_CMDPROC_FIND_INDEX_FAILED_WRITING_TO_LINEAR_COUNTER_API_BUSY	929h	Servo	Reset linear counter to "remember" the aligned slot position
SRV_CMDPROC_LINEAR_COUNTER_NOT_RECORDED_PREVIOUSLY	92Ah	Servo	Linear counter not reset with RECORD ALIGNED SLOT command prior to this command
SRV_SEQ_POWER_ON_INIT_FAILED_WRITING_TO_LINEAR_COUNTER_API_BUSY	92Bh	Servo	Reset linear counter failed during power on recovery
SRV_CMDPROC_INVALID_STATE_FOR_RAMP_HEAD_COMMAND	92Ch	Servo	Ramp head command rejected, tape not loaded
SRV_CMDPROC_TAPE_NOT_MOVING_FOR_RAMP_HEAD_COMMAND	92Dh	Servo	Ramp head command rejected, tape not moving
SRV_CMD_INVALID_HEAD_POSITION_SPECIFIED_IN_CHANGE_TRACKING_MODE	92Eh	Servo	Head position not a valid tracking head position
SRV_CMD_INVALID_HEAD_POSITION_SPECIFIED_IN_WRAP_RESTART_TRACKING	92Fh	Servo	Head position not a valid tracking head position for restart tracking
SRV_MOVETAPE_SET_LC_NOTIFICATION_FAILED	930h	Servo	Attempt to set linear counter mark failed since already past point.
SRV_CMDPROC_REJ_TAPE_NOT_READY	931h	Servo	Tape ready for retension
SRV_STEP_HEAD_EXPECTING_MOVING_UP_WITH_ADDED_HYSTERESIS_AFTER_REFERENCE_SENSOR_HIGH	932h	Servo	Expecting moving up with added hysteresis after reference sensor high
SRV_CMD_INVALID_COMMAND_CALLED_SEQUENCE_IS_NULL	933h	Servo	Invalid command called or invalid message sent to sequencer
SRV_TIMEOUT_DURING_HEAD_STEPPER_STOPPING_AFTER_SEACHING_FOR_SERVO_BUNDLE	934h	Servo	Timeout during head stepper stopping after seaching for servo bundle
SRV_TIMEOUT_DURING_HEAD_STEPPER_MOVING_UP_WITH_ADDED_HYSTERESIS_AFTER_REFERENCE_SENSOR_HIGH	935h	Servo	Timeout during head stepper moving up with added hysteresis after reference sensor high
SRV_STEP_HEAD_EXPECTING_SEACHING_FOR_SERVO_BUNDLE	936h	Servo	Expecting seaching for servo bundle
SRV_STEP_HEAD_EXPECTING_HYSTERESIS_BEFORE_SEARCHING_FOR_SERVO_BUNDLE_IN_OTHER_DIRECTION	937h	Servo	Expecting hysteresis before searching for servo bundle in other direction
SRV_STEP_HEAD_EXPECTING_SEARCHING_FOR_SERVO_BUNDLE_IN_OTHER_DIRECTION	938h	Servo	Expecting searching for servo bundle in other direction
SRV_STEP_HEAD_EXPECTING_STOPPING_AFTER_FAILING_SEACH_FOR_SERVO_BUNDLE_IN_OT	939h	Servo	Expecting stopping after failing seach for servo bundle in other di-

Message	VSCQ	Type	Definition
HER_DIRECTION			rection
SRV_STEP_HEAD_EXPECTING_STOPPING_AFTER_SEACHING_FOR_SERVO_BUNDLE	93Ah	Servo	Expecting stopping after seaching for servo bundle
SRV_STEP_HEAD_EXPECTING_STOPPING_AFTER_FAILING_SEACH_FOR_SERVO_BUNDLE	93Bh	Servo	Expecting stopping after failing seach for servo bundle
SRV_STEP_HEAD_EXPECTING_STOPPING_BEFORE_SEARCHING_FOR_SERVO_BUNDLE_IN_OTHER_DIRECTION	93Ch	Servo	Expecting stopping before searching for servo bundle in other direction
SRV_HEAD_STEPPER_MOVE_HEAD_TO_HEAD_POSITION_STATE_MACHINE_DEFAULT_ENCOUNTERED	93Dh	Servo	Head stepper move head to head position state machine default encountered
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_EXPECTING_SEARCHING_FOR_PES	93Eh	Servo	Head stepper offset calibration expecting searching for pes
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_EXPECTING_STOPPING_AFTER_PES_FOUND	93Fh	Servo	Head stepper offset calibration expecting stopping after pes found
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_EXPECTING_DEALING_WITH_HYSTERESIS	940h	Servo	Head stepper offset calibration expecting dealing with hysteresis
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_EXPECTING_STOPPING_AFTER_GOING_TO_NEW_OFFSET	941h	Servo	Head stepper offset calibration expecting stopping after going to new offset
SRV_FAILURE_TO_FIND_PES_DURING_HEAD_STEPPER_OFFSET_CALIBRATION	942h	Servo	Failure to find pes during head stepper offset calibration
SRV_HEAD_STEPPER_OFFSET_CALIBRATION_STATE_MACHINE_DEFAULT_ENCOUNTERED	943h	Servo	Head stepper offset calibration state machine default encountered
SRV_INCORRECT_DATA_BAND_ID	944h	Servo	Query for data band returned incorrect band ID
SRV_CALCULATED_LP1_VALUES_NOT_CONSISTENT	945h	Servo	Calculated LP1 sample array values vary too much. Cannot calculate LP1 from this set of samples
SRV_HEAD_STEPPER_PROCESS_STEP_MOTOR_STATE_MACHINE_DEFAULT_ENCOUNTERED	946h	Servo	unknown state encountered while head stepper process_step_motor function
SRV_MOVETAPE_TIMEOUT_IN_CRUISE_CONTROL	947h	Servo	
SRV_NEVER_SAW_SERVO_SIGNAL_DUE_TO_MECHANICAL_ISSUES	948h	Servo	
SRV_SERVO_SIGNALS_NOT_WITHIN_ACQUIRING_WINDOW_DUE_TO_MECHANICAL_ISSUES	949h	Servo	
SRV_FAILURE_DURING_TRACKING_BAND_LOCK_DUE_TO_MECHANICAL_ISSUES	94Ah	Servo	
SRV_FAILURE_DURING_TRACKING_RAMPING_DUE_TO_MECHANICAL_ISSUES	94Bh	Servo	
SRV_FAILURE_DURING_TRACKING_SETTLING_DUE_TO_MECHANICAL_ISSUES	94Ch	Servo	
SRV_FAILURE_DURING_TRACKING_PRE_TRACKING_DUE_TO_MECHANICAL_ISSUES	94Dh	Servo	
SRV_FAILURE_DURING_TRACKING_UNKNOWN_STATE_DUE_TO_MECHANICAL_ISSUES	94Eh	Servo	
SRV_NEVER_SAW_SERVO_SIGNAL_DURING_BACKWARDS_DUE_TO_MECHANICAL_ISSUES	94Fh	Servo	
SRV_SERVO_SIGNALS_NOT_WITHIN_ACQUIRING_WINDOW_DURING_BACKWARDS_DUE_TO_MECHANICAL_ISSUES	950h	Servo	
SRV_FAILURE_DURING_TRACKING_BAND_LOCK_DURING_BACKWARDS_DUE_TO_MECHANICAL_ISSUES	951h	Servo	

Message	VSCQ	Type	Definition
SRV_FAILURE_DURING_TRACKING_ RAMPING_DURING_BACKWARDS_DUE_TO_MECH ANICAL__ISSUES	952h	Servo	
SRV_FAILURE_DURING_TRACKING_SETTLING_D URING_BACKWARDS_ DUE_TO_MECHANICAL_ISSUES	953h	Servo	
SRV_FAILURE_DURING_TRACKING_PRE_TRACKI NG_DURING_BACKWARDS_DUE_ TO_MECHANICAL_ISSUES	954h	Servo	
SRV_FAILURE_DURING_TRACKING_ UNKNOWN_STATE_DURING_BACKWARDS_DUE_ TO_MECHANICAL_ISSUES	955h	Servo	
SRV_NEVER_SAW_SERVO_SIGNAL_DUE_TO_SE RVO_SIGNAL_ISSUES	956h	Servo	
SRV_SERVO_SIGNALS_NOT_WITHIN_ACQUIRING _WINDOW_DUE_TO_SERVO_SIGNAL_ISSUES	957h	Servo	
SRV_FAILURE_DURING_TRACKING_BAND_LOCK_ DUE_TO_SERVO_SIGNAL_ISSUES	958h	Servo	
SRV_FAILURE_DURING_TRACKING_ RAMPING_DUE_ TO_SERVO_SIGNAL_ISSUES	959h	Servo	
SRV_FAILURE_DURING_TRACKING_S1ETTLING_D UE_ TO_SERVO_SIGNAL_ISSUES	95Ah	Servo	
SRV_FAILURE_DURING_TRACKING_PRE_TRACKI NG_DUE_ TO_SERVO_SIGNAL_ISSUES	95Bh	Servo	
SRV_FAILURE_DURING_TRACKING_UNKNOWN_D UE_ TO_SERVO_SIGNAL_ISSUES	95Ch	Servo	
SRV_NEVER_SAW_SERVO_SIGNAL_DURING_BAC KWARDS_DUE_TO_SERVO_SIGNAL_ISSUES	95Dh	Servo	
SRV_SERVO_SIGNALS_NOT_WITHIN_ACQUIRING _WINDOW_DURING_BACKWARDS_DUE_TO_SER VO_SIGNAL_ISSUES	95Eh	Servo	
SRV_FAILURE_DURING_TRACKING_ BAND_LOCK_DURING_BACKWARDS_DUE_ TO_SERVO_SIGNAL_ISSUES	95Fh	Servo	
SRV_FAILURE_DURING_TRACKING_RAMPING_DU RING_BACKWARDS_DUE_TO_SERVO_SIGNAL_IS SUES	960h	Servo	
SRV_FAILURE_DURING_TRACKING_ SETTLING_DURING_BACKWARDS_DUE_TO_SERV O_SIGNAL_ISSUES	961h	Servo	
SRV_FAILURE_DURING_TRACKING_PRE_TRACKI NG_DURING_BACKWARDS_DUE_TO_SERVO_SIG NAL_ISSUES	962h	Servo	
SRV_FAILURE_DURING_TRACKING_ UNKNOWN_STATE_ DURING_BACKWARDS_DUE_TO_SERVO_SIGNAL _ISSUES	963h	Servo	
SRV_FAILURE_DURING_TRACKING_UNKNOWN_S TATE	964h	Servo	
SRV_FAILURE_DURING_TRACKING_UNKNOWN_S TATE_DURING_BACKWARDS	965h	Servo	
SRV_STEP_THREAD_TAPE_RAMP_TENSION_FAIL ED	966h	Servo	Dropping tape tension failed after taking up slack when cartridge is initially in-stalled before pin pick
SRV_INSUFFICIENT_GOOD_PES_DATA_CANNOT_ COMPUTE_DATA_BAND_ID	967h	Servo	Not enough good PES data to compare good top PES with corresponding good

Message	VSCQ	Type	Definition
			bottom PES.
SRV_GET_DATA_BAND_TIMEOUT_CANNOT_COMPUTE_DATA_BAND_ID	968h	Servo	PES state machine didn't finish capturing PES data within expected time frame.
SRV_MULTIPLE_SAMPLES_OF_MOTOR_INDEX_NOT_WITHIN_TOLERANCE	969h	Servo	Multiple sampling of motor index counts should be 4000 tach counts apart + / -1
SRV_COMMAND_REJECTED_WP_NEVER_FOUND_PHYSICAL_LP1_FROM_TAPE	96Ah	Servo	Reject command if Whirlpool never calculated physical lp1 from tape
SRV_INVALID_PCB_VERSION	96Bh	Servo	Only dakota_12 and dakota_13a are valid versions. Dakota_13b and dakota_13c are invalid
SRV_INVALID_CALIBRATION _VERSION	96Ch	Servo	Version in calibration memory is not valid (possibly test code)
SRV_UNLOAD_CART_EXCEEDED_RETRIES	96Dh	Servo	Unload cartridge process failed after retrying
SRV_UNLOAD_CART_RETRY_FAILED_LOAD	96Eh	Servo	Load failed during Unload Cartridge Retry
SRV_PARK_CART_DEFAULT	96Fh	Servo	Invalid state in Park Cart function
SRV_CMDPROC_INVALID_CARTRIDGE_IN_DRIVE_DURING_AUTO_LOAD	970h	Servo	Invalid cartridge in drive during autoload
SRV_REEL_FAST_REPOSITIONTAPE_API_CALL_FAILED_INVALID_STATE	971h	Servo	New fast repositionTape API call failed
SRV_UNABLE_TO_FIND_M1_MECH_INDEX	972h	Servo	Unable to locate drive motor mechanical index
SRV_UNABLE_TO_FIND_M2_MECH_INDEX	973h	Servo	Unable to locate cart motor mechanical index
SRV_UNLOAD_CART_RETRY	974h	Servo	Exception: Wasn't able to Unload the Cart Tray and will try again
SRV_THREAD_RETRY_MOVING_TO_DRIVE_HUB	975h	Servo	Exception: Something prevented the Load Arm from making it to the Drive Reel Hub while Threading and will try again
SRV_UNTHREAD_RETRY_RELEASING_PIN	976h	Servo	Exception: Was not able to get rid of the pin at the end of Unthread and will try again
SRV_UNTHREAD_RETRY_PUT_AWAY_PIN	977h	Servo	Exception: Something prevented putting away the pin into the cartridge during Unthread and will try again
SRV_UNTHREAD_RETRY_GOING_HOME	978h	Servo	Exception: Something prevented the Load Arm from going to Home Position after putting away the pin. Will try again.
SRV_UNTHREAD_RETRY_STUCK_ON_GUIDES	979h	Servo	Exception: Assume tape got stuck on guides during Unthread. Will try to unstick it.
SRV_THREAD_RETRY_RECOVER	97Ah	Servo	Exception: Something failed during Thread and will try to recover.
SRV_INVALID_CARTRIDGE_RADIUS	97Bh	Servo	Exception: if the cartridge radius is invalid when thread command is issue.
SRV_CART_REEL_OPEN_LOOP_RUNAWAY	97Ch	Servo	The cart reel moved more than expected (missed leader/broke tape?) during cartridge reel motor open loop tension
SRV_CART_REEL_CLOSED_LOOP_RUNAWAY	97Dh	Servo	The cart reel moved more than expected (missed leader/broke tape?) during cartridge reel motor closed loop

Message	VSCQ	Type	Definition
			motion
SRV_THREAD_RETRY_RECHUCKING_CARTRIDGE	97Eh	Servo	Exception: Wasn't able to pick pin from Cartridge. Cartridge was rechucked and will attempt Thread again.
SRV_LAST_MESSAGE	9FFh	Servo	